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Physicochemical Characteristics of *Xanthosoma Mafafa* Leaf Meal Subjected to Palm Bunch Ash Solution Treatment

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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 blanch cocoyam (*Xanthosoma mafafa*) leaf meal (XMLM) at 100°C for three minutes and the effect on its physical and proximate compositions was determined. The bulk density, total solids, specific gravity, water holding capacity and pH values of XMLM increased with increasing ash solution concentration, while ether extract and crude fiber values decreased with increasing ash solution concentration, with control (A) value being significantly higher ($p<0.05$) than those of the treated samples. The reverse was, however, the case for total ash and NFE values, with control value being significantly lower than the values of ash solution treated samples ($p<0.05$). The XMLM was generally high in crude protein value (28.31%). The nutrient value of XMLM could, therefore, be enhanced through blanching with palm bunch ash solutions.

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

Introduction

Cocoyam leaf meals (CLM) are rich in protein, carbohydrate, vitamin A and K among other nutrients (Odedeji *et al.,* 2014). CLM such as *Xanthosoma mafafa* leaf meal (XMLM) containing 16.41- 25.71% crude protein could, therefore, substitute costly protein ingredients in animal diets (Olaleye *et al.,* 2013). CLMs, however, contain anti-nutrients such as oxalates and tannins that make them unsuitable for animal feeding without further processing. Odedeji *et al.* (2014) reported that boiling improves the nutrient value of CLM by reducing the concentration of tannin and other anti-nutrients. Ani *et al.* (2015) also reported that plantain peels ash solutions at 100°C could serve as a debittering agent improving the nutritional value of leafy vegetables. Since the palm bunch ash solution is a local food tenderizer (Narisu *et al.,* 2011), it could be used as a blanching agent to improve the nutrient value of XMLM.

The objective of this study is therefore to determine the physicochemical characteristics of *X. mafafa* leaf meal blanched in varying concentrations 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, E, and F respectively. The *X. mafafa* leaves were cut into small pieces and blanched by boiling them at 100°C for three minutes in the ash solutions and thereafter allowing them to cool before being removed and air dried until they became crispy to touch. The XMLMs were analyzed in the laboratory for their physical and proximate compositions according to the methods of AOAC (2010).

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

Table 1 showed that the overall bulk density, total solids, specific gravity, water holding capacity and pH values of the ZMLM increased with increasing concentration of the ash solution used in blanching process. Specifically, the WHC of the 1.00% ash treatment (E) was different from the control by as much as 1800%, while for other treatments it was more than 900%. Table 2 showed the proximate composition of blanched XMLM. The moisture content ranged from 9.72 – 11.02 %, with a mean value of 10.61%, indicating that the samples were properly dried.

The leaf meal was high crude protein value of 28.31%, with values increasing slightly up to the 0.50% treatment before decreasing. Ether extract and crude fiber generally decreased increasing ash solution concentration, with control value being significantly higher ($p<0.05$) than those of ash treated samples. The reverse was, however, the case for total ash and NFE values, with control value being significantly lower than those of ash treated samples. Odedeji *et al.* (2014) obtained similar increases in crude protein value by blanching *Colocasia esculenta* in water at 80°C for 15 minutes and attributed the increase to the elimination of the tannin that precipitates protein in the raw sample. Similarly, Ani *et al.* (2015) reported a general increase in the mineral values of *Lacianthera africana,* after blanching in plantain peel ash solution at 100°C for 3 minutes.

Conclusion

The nutrient value of XMLM could, therefore, be enhanced through blanching with palm bunch ash solutions. There is the need to determine the effect of such ash solution blanching on the anti-nutrient composition of *Xanthosoma mafafa* leave meal.

Table 1: Physical characteristics of the blanched *X. mafafa* leave meal

Parameters/Samples	A	B	C	D	E
Bulk density (g/ml)	0.45	0.56	0.55	0.57	0.60
Total solids	2.2844	2.9554	4.698	3.1889	3.7205
Specific gravity	0.45	0.56	0.55	0.57	0.60
Water holding capacity (%)	4.30	42.36	42.95	37.23	81.61
PH	6.39	7.03	7.17	7.35	7.47

Legend: A= No ash solution treatment (control); B= 0.25% ash solution treatment; C= 0.50% ash solution treatment; D= 0.75% ash solution treatment; E= 1.00% ash solution treatment.

Table 2: Proximate composition (%) of blanched *Xanthosoma mafafa* leave meal

Parameters	A	B	C	D	E	Mean	SEM
Moisture	9.72^{d}	11.02^{a}	10.73^{bc}	10.73^{bc}	10.87^{ab}	10.61	0.12375
Crude protein	28.47^{b}	28.54^{ab}	28.72^{a}	28.07^{c}	27.74^{d}	28.31	0.09878
Ether extract	15.15^{a}	14.36^{b}	11.50^{c}	10.22^{d}	9.73^{e}	12.19	0.58439
Crude fiber	3.54^{a}	3.06^{b}	2.77^{c}	2.43^{d}	2.83^{d}	2.83	0.11554
Total ash	7.7950^{e}	8.1800^{d}	8.9100^{c}	10.1800^{b}	10.6750^{a}	9.1480	0.29852
NFE	35.3350^{c}	34.8450^{d}	37.4100^{b}	38.3800^{a}	38.6200^{a}	39.9180	0.41674

Legend: As in Table 1.

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