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Physicochemical Characteristics of *Xanthosoma mafafa* Tuber 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*) tuber meal (ZMTM) at 100°C for three minutes and the effect on its physical and proximate composition was determined. The bulk density, total solids, specific gravity, water holding capacity and pH values of ZMTM increased with increasing ash solution concentration, while crude fat, fiber, and NFE values decreased, with control value being significantly higher ($p<0.05$) than those of the treated samples. The reverse was, however, the case for total ash and crude protein and total ash values for which control value was significantly lower than ash treated samples values ($p<0.05$). The ZMTM was comparable to maize and sorghum in its crude protein value (11.47%). The nutrient value of ZMTM could, therefore, be enhanced through blanching with palm bunch ash solutions.

Keywords: Cocoyam, *Xanthosoma mafafa,* tuber meal, anti-nutritional factors

Introduction

Xanthosoma species of cocoyam has been reported to have readily digestible starch content due to its small particle size but the use of this species of cocoyam as food and feed is limited by the presence of anti-nutritional factors such as oxalates, phytates, tannins, saponins, phenols and trypsin inhibitors (Agwunobi *et al*., 2002). Recent studies have shown the value of blanching agents such as heat applied through boiling water, roasting and frying in the reduction of such endogenous anti-nutritional factors of cocoyam (McEwan *et al.,* 2014). Ani *et al.* (2015) also reported the effectiveness of debittering agents such as plantain peel ash in reducing the level of such anti-nutritional factors in leafy vegetables indicating that such a technology could also be applied to cocoyam tuber meal.

This study determined the physicochemical characteristics of *Xanthosoma mafafa* tuber meal subjected to palm bunch ash solution treatment.

Materials and Methods

The tubers 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. Pulped *X. mafafa* tuber meal (XMTM) was produced by grinding the peeled, washed and dried X mafafa tuber. The XMTMs were then 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 caked. The XMTMs were analyzed in the laboratory for their physical and proximate compositions according to the methods of AOAC (2010).

Results and Discussion

The physical characteristics results (Table 1) showed that bulk density, total solids, water holding capacity and specific gravity values of XMTM generally decreased due to palm bunch ash solution treatment, with values decreasing with increasing ash solution concentration. Ojinnaka *et al.* (2009) contrarily reported higher bulk density for blanched cocoyam samples. The pH of the samples remained moderately acidic irrespective of the concentration of ash solution used in the treatment.

Table 2 shows that the moisture content values were low and indicated that the samples were dry enough and will not support mold growth when stored. Crude fat, crude fiber, and NFE values decreased with increasing ash solution treatment, while the reverse was the case for crude protein (CP) and total ash values. Odedeji *et al.* (2014) reported an increase in CP values after blanching and attributed it to the elimination of tannin which usually precipitate protein in raw samples when present. The mean CP value of 11.47% is similar to that of maize. XMTM was also relatively rich in crude fat and NFE indicating that it could be used in place of maize in the diets of monogastric animals.

Table 1: Physiochemical composition of *Xanthosoma maffafa* tuber meal

Parameters	A	B	C	D	E
Bulk density (g/mi)	0.46	0.36	0.36	0.38	0.39
Total solids	12.23	10.69	7.26	8.54	9.54
Water holding capacity (%)	65.83	47.20	36.08	10.33	18.55
Specific gravity	0.46	0.36	0.36	0.38	0.39
pH	4.67	4.70	4.72	4.73	4.75

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: The proximate composition (%) of *X maffafa* tuber meal

Parameters	A	B	C	D	E	Mean	S.E.M
Moisture	10.54^{c}	10.88^{b}	10.39^{c}	11.69^{a}	10.18^{d}	10.73	0.1426
Crude protein	10.38^{e}	11.10^{d}	11.45^{c}	11.77^{d}	12.66^{a}	11.47	0.20155
Crude fat	6.75^{a}	6.62^{b}	6.46^{c}	6.31^{d}	6.01^{e}	6.43	0.06886
Crude fiber	6.64^{a}	6.56^{b}	6.51^{b}	5.03^{d}	5.31^{c}	6.01	0.18515
Total ash	3.66^{e}	4.35^{d}	5.01^{c}	6.26^{b}	7.45^{a}	5.35	0.3649
NFE	62.04^{a}	60.49^{b}	60.19^{c}	58.94^{d}	58.40^{e}	60.01	0.34118

Legend: As in table 1

Conclusion

It was concluded that blanching with palm bunch ash solutions improves the nutrient value of XMTM. There is, however, the need to determine the effect of such ash solution blanching on the anti-nutrient composition and energy value of *Xanthosoma mafafa* tuber meal.

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