Effect of *Pandenus candelabrum* and *Musa paradisiaca* Leaf Packagings on Levels of Antinutrients in Some Nigerian Local Delicacies

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ABSTRACT

The effect of the use of Pandenus candelabrum (etere) and Musa paradisiaca (plantain), leaves as packagings in the cooking of two local Nigerian delicacies i.e. moi – moi and okpa on their levels of tannins, saponins, oxalates and sensory evaluations were investigated. Using the etere leaves as packagings leached 94.83%, 50.00% and 20.00% of tannins, saponins and oxalates, respectively, from the leaves while using the plantain leaves as packaging leached 78.18%, 50.00% and 33.33% of tannins, saponins and oxalates, respectively, from the leaves. Packaging and cooking moi – moi in etere leaves imparted 191.6%, 150% and 38.46% of tannins, saponins and oxalates, respectively, to it, while packaging and cooking okpa in plantain leaves imparted 51.25%, 36.36% and 32.35% of tannins, saponins and oxalates, respectively, to it. Phytochemical analysis of the cooking water samples showed that those used in cooking the delicacies packaged in leaf samples contained tannins and saponins. Packaging in the leaf samples also enhanced the taste, flavour and overall acceptance of the delicacies. The results revealed that packaging and cooking the delicacies in leaf samples increased their anti – nutrient contents (with tannins being the most imparted), the taste, flavour and overall acceptance of the delicacies.

Keywords: Anti – nutrients, delicacies, leaf, packaging.

INTRODUCTION

Cowpea (*Vigna unguiculata*) and bambara groundnut (*Voandzela substerranea*) have been widely utilized for food mainly because of their protein contents which range from 19.2% to 23.3% (Eyeson and Ankra, 1975). These grain legumes have hard seed coats or testae and require prolonged cooking. Extending cooking time may also be required to detoxify some of the legume species, which have been found to contain some anti – nutritional factors (WHO, 1987).

Anti-nutrients in foods are of interest because of their effects on food quality. Tannin, a polyphenol and one of the major anti – nutrients, is extensively located in the testae of the seeds, thus reducing the nutritive value of the bean – meal as they cause digestibility reducing problems when they complex with the protein (and enzymes) (Kumar and Singh, 1984). Saponins, another anti – nutrient, haemolyse red blood cells (Newbern, 1980). But improvement in nutritive value of beans has been associated with the removal of the testae (Lorenz, 1983). The grain legume can be milled into paste which is used for various traditional food preparations eg, moi – moi and 'okpa' (a popular delicacy in the Nsukka zone in Nigeria. These traditional food preparations can be packaged using leaves (traditional packaging). The leaves are normally collected from trees,

influence of the presence of other compounds on their toxic effects as well as method of processing of the food before ingestion.

Records on the toxic doses of tannins and saponins are scanty. Levels of tannins above 5% of the diet are often lethal (Cannas, 2001). However, Freeland *et al.* (1985) demonstrated that toxic effects of high tannin diets in rats could be reversed by addition of saponins (which are themselves toxic). The saponin content of the delicacies, which varied from 1.0% to 2.5%, could go a long way towards ameliorating the tannin contents of the delicacies (Table 1), which varied from 24.0mg/100g to 242mg/100g (i.e. 0.024% to 0.242%). The adverse health effect of oxalate poisoning is in its ability to combine with serum calcium to form insoluble calcium oxalate thus reducing the availability of dietary calcium (Dresbach, 1980). Graham (1962) had shown that 15g of oxalate were considered to be high as a toxic dose. The oxalate content of the delicacies analysed ranged from 0.26% to 0.45% (i.e. 2.6g/kg to 4.5g/kg). Thus the amount of moi-moi and okpa required to be eaten at once to produce the toxic dose (assuming no "tie-up" or chelation with Ca^{2+}) would vary from 5.77kg to 3.33kg. Since any one individual does not separately consume such quantities of moi-moi and okpa at once, the possibility of oxalate poisoning from Nigeria leaf packaged moi-moi and okpa seem very unlikely.

In general however, a compound will accumulate in the body after repeated intake if its elimination or biotransformation is slower than the frequency of uptake. Repeated doses of a toxic substance may be taken up and subsequently stored without apparent toxicity until the storage receptors become saturated; then toxicity suddenly occurs (Zakrzewski, 1991).

CONCLUSION

The ancient practice of using leaves as wrappings/packaging in the course of preparing delicacies like moi-moi and okpa no doubt improves their tastes, flavour and overall acceptance; it also increases the levels of anti-nutrients in such packaged foods.

Table 1: Results of Levels of Anti – nutrients in Leaf and Delicacy Samples, % Anti – nutrient leached from leaf and % Imparted to Samples

Sample	Tannin mg/100g	% Leached	% Imparted	Saponin (%)	%Leached	%Imparted	Oxalate (%)	%Leached	% Imparted
Etere UN	22440.00 ± 0.00	–	–	3.00 ±0.12	–	–	0.50 ± 0.10	–	–
Etere US	1160.00 ± 0.01	94.83 ± 0.11	–	1.50 ± 0.00	50.00 ± 0.11	–	0.40 ± 0.00	20.00 ± 0.22	–
Plantain UN	922.00 ± 0.11	–	–	2.00 ± 0.01	–	–	0.51 ± 0.00	–	–
Plantain US	192.00 ± 0.01	79.18 ± 0.13	–	1.00 ± 0.20	50.00 ± 0.20	–	0.34 ± 0.11	33.33 ± 0.02	–
Moi–moi PC	24.00 ± 0.12	–	–	1.00 ± 0.00	–	–	0.26 ± 0.00	–	–
Moi-moi LE	70.00 ± 0.12	–	191.67 ± 0.13	2.50 ± 0.00	–	150 ± 0.00	0.36 ± 0.00	–	38.35 ± 0.20
Okpa PC	160.00 ± 0.11	–	–	1.10 ± 0.10	–	–	0.34 ± 0.11	–	–
Okpa PL	242.00 ± 0.00	–	51.25 ± 0.00	1.50 ± 0.14	–	36.36 ± 0.10	0.45 ± 0.03	–	32.35 ± 0.00

* Values are means ± S.D of triplicate determinations
UN = Unused leaf; US = used (cooked leaf); PC = cooked in plastic container; LE = cooked in etere leaves; PL = cooked in plantain leaves.

Table 2: PHYTOCHEMICAL CONTENTS OF COOKING WATERS*

	Sample			
Phytochemical	moi – moi PC	moi – moi LE	okpa PC	okpa PL
Tannin	–	+	–	+
Saponins	–	+	–	+
Oxalates	ND	ND	ND	ND

* Values are means of triplicated determinations
– = not detected; + = detected. N.D = not determined.

Table 3: Summary of Sensory Evaluation

	Av. Score for sample			
Attribute	moi-moi PC	moi-moi EL	okpa PC	okpa PL
Aroma	3.5±0.00	3.3±0.01	3.2±0.01	3.0±0.11
Colour	4.0±0.10	3.2±0.02	4.1±0.11	3.3±0.10
Taste	3.2±0.12	4.5±0.11	3.2±0.02	4.3±0.10
Flavour	3.5±0.00	4.2±0.11	3.6±0.03	4.2±0.00
Ovarall Acceptance	2.5±0.11	4.5±0.04	3.0±0.00	4.3±0.04

*Values are means ± S.D of ten determinations.

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