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PROXIMATE COMPOSITION, ANTINUTRIENTS AND SENSORY PROPERTIES OF MELON CAKES COOKED WITH DIFFERENT PACKAGING MATERIALS

UDOIDEM, I. U. AND ENWERE, N. J.
Department of Food Science and Technology,
University of Nigeria, Nsukka, Nigeria.
Corresponding author: easylife4prof@yahoo.com, 08028342404

ABSTRACT: Melon cake was prepared using the conventional method from melon, ground yeast and other ingredients. The dough obtained after the oil had been extracted was packaged with different packaging materials (plantain leaves, polyethylene and aluminium foil) before cooking. Part of dough was cooked without package and this served as the control sample. Cakes obtained after cooking, were analysed for proximate composition, antinutrients and sensory properties Cake cooked without package had the highest moisture content of 52.94% while cake that was packaged with aluminium foil had the highest protein content of 23.27% and was significantly different ($p < 0.05$) from other cakes. The antinutrients levels in cakes packaged with polyethylene and aluminium foil were higher than those obtained from other cakes. Cake packaged with plantain leaves was adjudged the best from the sensory analysis.

INTRODUCTION

Melon cake is a traditional snack produced from melon, ground yeast and other minor ingredients (pepper, salt, onion, knorr cube and water). Melon cake is a delicacy enjoyed mostly in the southern part of Nigeria. In Igbo land, some area referred to it as *Osu* while others called it *Ọgbala – ọtịị*. In Northern Cross River State, it is called *Bikem atar*; in Akwa Ibom State, it is called *Ikpan*.

Melon seed is rich in oil and protein and poor in carbohydrate content. It is rich in methionine content, magnesium and calcium, Achinewhu, (1998). Melon has low water absorption property but its other functional properties, like fat absorption capacity allows its usage in food formulation as flavour retainer. Its low gelation property allows its usage as additive to other gel forming materials in food products, Aletor and Ojelabi (2007). Snacks produced from melon can be a cheap source of nutrient (protein) to the low income earners in Nigeria. Although, melon cake is a food item in most homes with a long history of consumption, there exists a paucity of information on its nutrients, antinutrients and sensory attributes. In the preparation of melon cake, the dough obtained from melon meal after oil extraction is normally cooked in water without package. It was therefore, the objective of this study to use different available packaging materials (plantain leaves, polyethylene and aluminium foil) in packaging melon dough before cooking and evaluating the effect of the different packaging materials on the proximate composition, antinutrients and sensory attributes of melon cakes.

MATERIALS AND METHODS

The melon kernels and ground yeast (*isuo*) were purchased from Nsukka market and taken to Food Science and Technology laboratory, University of Nigeria, Nsukka, where the study was carried out. The melon kernels were sorted and ground into meal using a manual grinder. The ground yeast was milled into flour after scraping off the external portion. The recipe used for the preparation of the cakes (samples) was as shown in Table 1.

Table 1: Recipe used in the preparation of melon cake

Ingredients	Weight (g)	Percentage (%)
Melon meal	247.54	70
Ground yeast	31.16	8.81
Pepper	2.0	0.57
Knorr cube	4.1	1.16
Onion	32.1	9.08
Salt	17.2	4.86
Water	19.53	5.52
Total	353.63	100

In preparing the cake, the ground yeast flour and the melon were blended in a mortar using a pestle. Pepper, salt, knorr cubes and onion were added to the meal in the mortar and blended to the desired consistency. Hot water was added in small quantity continuously and blended with pestle to express oil from the meal. The oil was separated from the meal to get the dough; the dough was moulded into size, packaged (with plantain leaves, polyethylene and aluminium foil) and cooked for five hours. The dough that was cooked without package served as the control sample. The cakes obtained were used for various determinations.

METHODS OF ANALYSIS

Proximate analysis was carried out on the cakes using the methods of the Association of Official Analytical Chemists, AOAC (1995). Trypsin inhibitor was determined by method of Arntfield, *et al.* (1985). Phytate was determined by method of Latta and Eskin (1980). The method of Burns, (1971) was used to determine the tannin content while saponin content was determined by the modified method of Fenwick and Oakenfull (1981).

Sensory Evaluation

Sensory evaluation was carried out using a panel of 20 trained judges (students of the Department of Food Science and Technology, University of Nigeria, Nsukka.) to choose the preferred cake from the samples. The samples were scored for appearance, colour, taste, hardness, mouth feel and overall acceptability on a 9- point hedonic scale, with 9 representing like extremely, 5- neither like nor dislike and 1- dislike extremely. The judges rating were analysed using analysis of variance (ANOVA) and Least Significant Difference (LSD) was used to separate the means Akindele, (2004).

Statistical Analysis

Data obtained from this work were analysed using Analysis of Variance and Duncan's New Multiple Range Test, Akindele, (2004) was used to separate the means.

RESULTS AND DISCUSSION

The proximate composition of the cakes is given in Table 2. The moisture content of the cakes decreased significantly ($p < 0.05$) from 52.94% in the cake that was cooked without package to 38.25% in the cake that was packaged with aluminium foil. The decrease was due to low level of permeation of water by the different packaging materials. The pores in the plantain leaves allowed the passage of minimal quantity of water into the cake from the cooking water. The polyethylene and aluminium foil served as barriers preventing the permeation of water into the cakes that were packaged with them. Cake that was cooked without package had the lowest protein content than the other cakes; this could be attributed to the leaching of nutrients out from the cake into the cooking water. The inability of nutrient to leach out from the cakes that were packaged with polyethylene and aluminium foil resulted in the higher content of protein (22.74% and 23.27%) in these cakes than cakes that were packaged with plantain leaves (20.00%) and that cooked without package (16.14%). There might have been a leaching out of soluble proteins from cake that was packaged with plantain leaves through the pores of the

plantain leaves into the cooking water. Cake that was cooked without package had cracks all over the body which allowed the permeation of water into the cake and leaching out of some nutrients from the cake. This can be seen in the lower contents of the nutrients (proteins-16.14%, fat-8.92%, ash-1.52% and fibre-0.94%) in this cake relative to other cakes.

Table 2: Proximate composition of the melon cakes

Sample code	Moisture (%)	Crude Protein (%)	Fat (%)	Ash (%)	Crude fibre (%)	Carbohydrate (%)
K	$46.58^{c}\pm0.480$	$20.00^{b}\pm0.447$	$10.69^{b}\pm0.285$	$4.10^{b}\pm0.072$	$2.72^{b}\pm0.216$	$15.91^{b}\pm0.435$
L	$39.74^{b}\pm0.140$	$22.74^{c}\pm0.400$	$13.38^{c}\pm0.770$	$6.72^{c}\pm0.310$	$4.48^{c}\pm0.625$	$12.94^{a}\pm0.570$
M	$38.25^{a}\pm0.360$	$23.27^{d}\pm0.409$	$13.80^{d}\pm0.043$	$6.99^{c}\pm0.684$	$4.63^{c}\pm0.467$	$13.06^{a}\pm0.206$
N	$52.94^{d}\pm1.061$	$16.14^{a}\pm0.043$	$8.92^{a}\pm1.086$	$1.52^{a}\pm0.086$	$0.94^{a}\pm0.327$	$19.54^{c}\pm0.678$

Results were the mean ±SD of triplicate determinations; values carrying different superscript in the same column are significantly different ($p < 0.05$).
K = packaged with plantain leaves
L = packaged with polyethylene
M = packaged with aluminium foil
N = without package

The fat, ash and crude fibre contents of cakes packaged with polyethylene and aluminium foil were higher than those of cakes packaged with plantain leaves and that cooked without package. There was no significant difference ($p > 0.05$) in the fat and crude fibre content of cakes packaged with polyethylene and aluminium foil. Conversely, the carbohydrate contents of cakes packaged with polyethylene and aluminium foil were lower than those obtained from cakes that were packaged with plantain leaves and that cooked without package. Cakes packaged with plantain leaves and that cooked without package had similar saponin content of 0.5% (Table 3).

Table 3: Anti –nutrients in the melon cakes

Sample code	Saponin (%)	Tannin (%)	Phytate (%)	Trypsin inhibitor (TIU/mg)
K	$0.50^{a}\pm 0.010$	$0.109^{b}\pm0.0010$	$0.25^{a}\pm0.010$	$4.50^{a}\pm0.005$
L	$1.00^{b}\pm0.017$	$0.141^{c}\pm0.0017$	$0.30^{a}\pm0.017$	$4.49^{a}\pm0.026$
M	$2.00^{c}\pm0.034$	$0.139^{c}\pm0.0017$	$0.50^{b}\pm0.023$	$4.48^{a}\pm0.034$
N	$0.50^{a}\pm0.010$	$0.094^{a}\pm0.0034$	$0.25^{a}\pm0.043$	$4.50^{a}\pm0.017$

Results are the mean ±SD of triplicate determinations; values carrying different superscript in the same column are significantly different ($p<0.05$).
K = packaged with plantain leaves
L = packaged with polyethylene
M = packaged with aluminium foil
N = without package

Cakes packaged with polyethylene and aluminium foil had saponin content of 1.0% and 2.0% respectively. The higher content of the antinutrient in cakes that were packaged with polyethylene and aluminium foil relative to other cakes may be due to the inability of the antinutrient(saponin) to leach out from the packaging materials into the cooking water. Antinutrients may be reduced by moist heat and leaching out into discarded water Obi, (2002). Similarly, the tannin, phytate and trypsin inhibitor levels in the cakes packaged with polyethylene and aluminium foil were higher than the antinutrient levels obtained for cakes that

was packaged with plantain leaves and that cooked without package. This may be due to barrier posed by the packaging materials to the passage of these antinutrients into the cooking water. Boiling is said to reduce tannin level in processed legumes, but this reduction is significant if the boiling was preceded by fermentation, Okaka, (2005). Several workers have also reported on the reduction in these antinutrients with cooking, Sokeye, *et al*., (2009), Igbedioh, *et al* (1994) and Duhan, *et al*., (1989). The results of sensory evaluation carried out on the cakes are given in Table 4.

Table 4: Sensory properties of the melon cakes

Sample code	Colour	Taste	Appearance	Hardness	Mouth feel	Overall acceptability
K	7.65^{a}	7.60^{a}	8.25^{a}	8.00^{a}	60^{a}	7.80^{a}
L	3.10^{c}	6.60^{b}	6.55^{bc}	6.10^{bc}	6.10^{b}	6.10^{b}
M	3.10^{c}	5.40^{c}	6.60^{b}	6.50^{b}	5.60^{bc}	5.90^{bc}
N	6.40^{b}	4.70^{c}	6.25^{bc}	6.15^{bc}	5.80^{bc}	5.60^{bc}
$LSD_{0.05}$	0.573	0.746	0.609	0.858	0.786	0.864

Values followed by the same superscripts in the same column are not significantly different ($p > 0.05$)
K = packaged with plantain leaves
L = packaged with polyethylene
M = packaged with aluminium foil
N = without package

The results showed that cake that was packaged with plantain leaves was preferred by the judges. The data showed that the cake packaged with plantain leaves had the best overall sensory properties which were significantly ($p < 0.05$) different from cakes packaged with other materials. For colour, cake packaged with plantain leaves had the highest treatment mean of 7.65 which was close to 8 (a positive score for colour) and cream colour whereas cakes packaged with polyethylene and aluminium foil had treatment mean of 3.1 respectively and brown colour. This brown colour might have been due to the inability of some soluble components that have negative effect on colour from leaching out from the cakes. For taste, cake cooked without package had the lowest treatment mean of 4.70. This may be due to the leaching out of essential compounds/nutrients from the cake. For appearance, hardness, mouth feel and overall acceptability, cake that was packaged with plantain leaves had the highest treatment means of 8.25, 8.00, 7.60 and 7.80 and was significantly different($p<0.05$) from the other cakes in all these parameters.

CONCLUSION

The study has shown that polyethylene and aluminium foil prevented the leaching out of nutrients and antinutrients from the cakes whereas plantain leaves allowed the leaching out of minimal quantity of nutrients and greater quantity of antinutrients from the cake while cake cooked without package allowed a greater quantity of nutrients and antinutrients to leach out from the cake. A comparative assessment of nutrients, antinutrients contents and sensory properties of the cakes with respect to the different packaging materials showed that plantain leaves was the best packaging material. Thus, melon cake should be cooked packaged with plantain leaves rather than cooked without package.

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