



## Effect of Substitution of Melon with Soybean on the Nutrient Content and Sensory Properties of Traditional Cakes

\*Udoidem, I.U. and Enwere, N.J.<sup>1</sup>

### ABSTRACT

Traditional cakes were prepared from a blend of melon and soybean meal. The blended meal contained 10% and 20% soybean respectively while unblended meal contained 100% melon meal which served as control. Cakes obtained from the blends were analysed for proximate composition, amino acid content and organoleptic properties. The moisture content and protein content of the cakes increased significantly ( $p < 0.05$ ) as the level of soybean inclusion was increased while the fat, ash and crude fibre contents of the cakes decreased significantly ( $p < 0.05$ ) as the level of soybean inclusion was increased. Inclusion of as little as 10% soybean increased the quantity of amino acids in the cake than the control cake. The organoleptic properties of the cakes were also acceptable at 10% level of soybean inclusion.

**Keywords:** Traditional cake, proximate composition, melon, soybean, amino acid content, organoleptic properties.

### Introduction

Melon (*Citrullus vulgaris Schrad*) belongs to the family of *cucurbitaceae* and is a monoecious plant grown from seeds and creeps with plant population density of 20,000 to 40,000 plants per hectare (Achinewhu, 1998). Melon seeds are milled and used to prepare the popular *egusi* soup where they act as food thickeners. In addition, they are milled, mixed with pepper, salt, crayfish and other ingredients and moulded in balls, cooked and dried over fire to produce *Mbam* or *Ikepan* (in Ibibio), otherwise known as melon cake. Melon seed is rich in oil and protein but poor in carbohydrate. Its seeds are low in lysine content but high in methionine content (Achinewhu, 1998).

Soybean (*Glycine max L*), an important oil seed belonging to the family *leguminosae* is usually grown as food crop (Iwe, 2003). Soybean is a source of

vegetable oil, high protein cake, soy flour, soy milk, soy beverages and tofu. Soybeans are incorporated into cereals, tubers, roots and other legumes to improve the nutrient content of these food materials (Enwere, 1998). The mature seeds of soybean are rich in protein (40%) and oil content (20%), and have a carbohydrate content of about 30%. It is rich in lysine but poor in cysteine and methionine content (Elegbede, 1998).

Snacks can be considered as tasty, savoury or sweet foods eaten at non-meal occasions. They are small meals eaten between main meals. Healthy snacks help to bridge the gap between meals. Melon cake is a traditional snack made from melon, ground yeast and other ingredients such as pepper, salt, onion, knorr cube and water. Variation in nutrient contents of melon and soybean (especially with regard to lysine and methionine) necessitated the combination of these local seeds to produce traditional snack with a more balanced nutrient. This work was aimed at substituting melon with

<sup>1</sup> Department of Food Science and Technology, University of Nigeria, Nsukka, Nigeria.

\* corresponding author: [easylife4prof@yahoo.com](mailto:easylife4prof@yahoo.com)

various proportions of soybean and evaluating the effect of substitution on the nutrient and sensory properties of the cakes produced from the blends.

### Materials and Methods

The melon kernels, soybean seeds and ground yeast (*isuo*) were purchased from Nsukka market and taken to the 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 soybean seeds were cleaned to remove contaminants and thereafter dehulled and milled

into meal. The ground yeast was milled into flour after scraping off the external portion.

Melon meal was substituted with 10% and 20% soybean meal while the 100% melon meal was used as the control sample. The two levels of soybean substitution were chosen for this study after preliminary experiment because above 20% soybean substitution, the dough of desired consistency could not be formed. The recipe used for the preparation of the control and blended samples is as shown in Table 1.

**Table 1: Recipe used in the preparation of cakes (unblended/blended)**

Ingredients	Weight (g)	Percentage (%)
Melon meal (unblended/blended)	247.54	70.00
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 meal 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 quantities 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, wrapped in plantain leaves and cooked for 5 h. The cakes obtained were used for various determinations.

The proximate composition of melon kernel used in preparing the cake were moisture (4.40%), crude protein (32.04%), ash (3.40%), crude fibre (6.59%), fat (43.07%) and carbohydrate (10.05%) while those of soybean were moisture (6.20%), crude protein

(39.02%), ash (4.32%), crude fibre (3.46%), fat (19.94%) and carbohydrate (27.06%).

### Methods of analysis

Proximate analysis was carried out on the cakes using the methods of the Association of Official Analytical Chemists (AOAC, 1995) while the amino acid analysis was carried out on the preferred cake and control sample using Technicon Sequential Multisample Amino acid Analyser (TSM) Technicon Instrument Co. Ltd., Basingstoke, United Kingdom as described by Benitez (1989).

### 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), who were familiar with the snack

to choose the preferred cake from the blended 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 T-test (Iwe, 2002; Ihekoronye and Ngoddy, 1985).

### Statistical analysis

Data obtained from this work were analyzed using analysis of variance (ANOVA) and Duncan's New Multiple Range Test (DMRT) as described by Obi (2002) 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 increased significantly ( $p < 0.05$ ) with increase in soybean substitution and ranged from 47.20% in the control sample to 52.60% in the cake that contained 20% soybean. This could be due to the water retention property of soybean constituents. Iwe (2003) had

earlier reported that soy flours in bakery products facilitate greater water incorporation, improve dough handling and improve moisture retention. Similarly, the crude protein content of the snacks increased with increase in soybean substitution and ranged from 18.05% in the control sample (cake) to 20.00% in the cake that contained 20% soybean. This increase was due to the higher content of crude protein in soybean relative to melon (FAO, 1982; Elegbede, 1998). Several workers have also reported increases in protein contents of foods supplemented with soybean (Ayo *et al.*, 2007; Edema *et al.*, 2005; Babajide *et al.*, 2003; Otegbayo *et al.*, 2002). Conversely, the fat, ash and crude fibre decreased with increase in soybean substitution (Table 2). The low level of fat and crude fibre in the substituted samples could be attributed to the lower content of fat and crude fibre in soybean relative to melon. The low fat content could also be due to the quantity of oil expressed from the dough during processing. The carbohydrate content in complementary cakes was higher than that of the control sample.

**Table 2: Proximate composition of the cakes**

Sample code	Moisture (%)	Crude protein (%)	Fat (%)	Ash (%)	Crude fibre (%)	Carbohydrate (%)
10% soybean	50.56 <sup>b</sup> ± 0.020	19.01 <sup>b</sup> ± 0.020	5.01 <sup>b</sup> ± 0.043	5.05 <sup>a</sup> ± 0.017	2.87 <sup>b</sup> ± 0.020	17.5 <sup>c</sup> ± 0.026
20% soybean	52.60 <sup>c</sup> ± 0.017	20.00 <sup>c</sup> ± 0.010	4.22 <sup>a</sup> ± 0.017	4.85 <sup>a</sup> ± 0.043	2.33 <sup>a</sup> ± 0.010	16.00 <sup>b</sup> ± 0.010
Control snack (100% melon)	47.20 <sup>a</sup> ± 0.020	18.05 <sup>a</sup> ± 0.020	10.44 <sup>c</sup> ± 0.005	5.39 <sup>b</sup> ± 0.017	5.09 <sup>c</sup> ± 0.005	13.83 <sup>a</sup> ± 0.026

Results are the mean ± SD of triplicate determinations; values carrying different superscript in the same column are significantly different ( $p < 0.05$ ).

Substitution of melon with 10% soybean resulted in increase in amino acid content in the blended cakes than the control sample (Table 3). Steinke (1992) had reported that all the nine essential amino acids required by humans could be found in the amino acids of soybean and their levels in soybean exceeded the amino acid requirements for children and adults.

Substitution of melon with 10% soybean increased the limiting amino acids lysine, methionine and cystine from 1.72 g/100 g protein – 3.11 g/100 g protein, from 0.57 g/100 g protein – 1.71 g/100 g protein and from 1.19 g/100 g protein – 2.11 g/100 g protein respectively. Thus, substitution of melon with 10% soybean in the preparation of the cakes increased the quantity of the limiting amino acids in the cakes thereby increasing the protein quality of the cakes.

**Table 3: Amino acid profile (g/100 g protein) of the snacks**

Amino acid	10% Soybean	Control snack (100% melon)
*Lysine	3.11	1.72
*Histidine	2.65	1.44
*Arginine	7.66	3.91
Aspartic acid	9.66	7.64
*Threonine	2.71	1.80
Serine	2.97	2.10
Glutamic acid	13.13	9.61
Proline	4.03	2.12
Glycine	4.71	2.31
Alanine	4.47	1.93
Cystine	2.11	1.19
*Valine	4.35	1.39
*Methionine	1.71	0.57
*Isoleucine	3.26	1.63
*Leucine	7.14	3.00
Tyrosine	3.22	1.61
*Phenylalanine	4.06	1.69

\* Essential amino acids

The results of sensory evaluation carried out on the cakes are given in Table 4. The results showed that cake containing 10% soybean was the most preferred by the judges. The data showed that, for colour, there was a significant difference ( $p < 0.05$ ) between the two cakes. Cake containing 10% soybean had a higher treatment mean of 7.9 which was close to 8 (a positive score for colour) than cakes containing 20% soybean. The results also showed that for other parameters (taste, appearance, hardness, mouth feel and overall acceptability), there was no significant difference ( $p > 0.05$ ) between the two cakes, but in all these parameters, cake containing 10% soybean had higher treatment mean than cake containing 20% soybean. Thus, cake containing 10% soybean was preferred to cake containing 20% soybean. This could be due to the increase in soybean content. Ayo *et al.* (2007) reported that addition of 10% soybean to wheat – acha – biscuits produced sensory attributes (colour, odour, taste and texture) that were acceptable but increasing soybean to a level of 20% and above resulted in sensory attributes that were not accepted.

**Table 4: Sensory properties of the cakes**

Sample code	Colour	Taste	Appearance	Hardness	Mouth feel	Overall acceptability
10% soybean	7.9 <sup>a</sup>	7.7 <sup>a</sup>	7.7 <sup>a</sup>	7.6 <sup>a</sup>	7.5 <sup>a</sup>	8.1 <sup>a</sup>
20% soybean	7.3 <sup>b</sup>	7.5 <sup>a</sup>	6.6 <sup>a</sup>	7.5 <sup>a</sup>	6.9 <sup>a</sup>	7.9 <sup>a</sup>
t <sub>cal</sub>	2.214	0.847	0.19	0.384	1.644	0.592

Values followed by the same superscripts in the same column are not significantly different ( $p > 0.05$ ).

## Conclusion

The study has shown that inclusion of 10% soybean in the preparation of the cake provided the needed nutrient as seen in the high content of protein and carbohydrate. It also increased the amino acid profile of the cake especially the limiting amino

acids thereby increasing the protein quality of the cake. The organoleptic properties of the cake were also acceptable at this level of soybean inclusion. Thus, the nutrient content of the cake can be increased at a cheaper cost since soybean is cheaper than melon.

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