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Sensory Properties of Ogiri in Nigerian Onugbu Soup Made from Two Varieties of Melon Seeds *Cucumis melo* and *Cucumeropsis manii*

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Abstract: The fermentation of two varieties of melon seeds *Cucumis melo*, *Cucumeropsis manii* to the condiment - ogiri using the leaves of *Musa* sp., were investigated. The percent proximate compositions of the seeds were ash 2.80 and 3.13, fat 45.65 and 55.93, protein 30.45 and 24.42, carbohydrate 16.31 and 11.83, moisture 4.79 and 4.69 while crude fiber was 6.33 and 2.60 respectively. Processing melon seeds to the condiment involved boiling seeds for 3 h, dehulling and then boiling for another 1 h, cooled and fermented for 4-5 days. Fermentation increased the pH value and total free amino acids, decreased Crude Protein (CP) and total soluble sugar, in the two samples. Evaluation of organoleptic properties reveal that there were significant differences ($p<0.05$) in taste and overall acceptability of the Onugbu soups prepared with ogiri from *Cucumeropsis manii*, market sample and *Cucumis melo*. The onugbu soup prepared with ogiri from *Cucumeropsis mannii* seeds however have significantly higher mean sensory score values than the ones from *Cucumis melo* and the market sample.

Key words: Melon seeds, Ogiri, organoleptic properties, onugbu soup, fermentation

INTRODUCTION

Melon seeds (Yoruba, Egusi) belong to the family Cucurbitaceae. They are mostly cultivated in the southern part of Nigeria and is usually inter planted with yam and cassava where it serves as a cover crop. It may account for up to 80% dietary protein and it is used as the only source of protein for some groups of people from where it is used as a substitute for meat or fish (Aidoo, 1986). Melon seeds have been reported to contain 3.3% moisture, 15.5% crude fibre, 10.3% crude protein, 8.2% carbohydrate, 52% oil and 3.6% ash (Omafuvbe *et al*., 2004).

This being the case, other forms of utilizing melon seeds is adjudged useful. Condiment (Ogiri) made from melon seeds is one of such (Achi, 2005). Ogiri is a food flavouring condiment prepared by traditional methods of uncontrolled solid state fermentation of melon seeds (*Citrullus vulgaris*) (Achi, 2005). Handling of Ogiri before, during and after fermentation is crucial since a lot off-flavour/aroma emanates. The use of chance fermentation coupled with unhygienic practices make the fermentation difficult to control and results in the contamination of the product with pathogens or other microorganisms capable of producing toxins or odourous compounds that can cause off-flavours. These factors have led to the rejection of this nutritious condiment. Hence this study is aimed at comparing the organoleptic properties of Ogiri produced hygienically using the HACCP principles (Asagbra *et al*., 2009) with those produced in the villages and sold in the local market.

MATERIALS AND METHODS

Two varieties of unshelled melon seeds: *Cucumis melo*, *Cucumeropsis manii* were purchased from the local markets in Ibadan and Lagos and fermented in the leaves of *Musa sp*.

Ogiri condiment fermented in *Thaumatococcus danielli* leaves were bought off the shelf in local markets and from a major producer of ogiri in south - west of Nigeria.

Fermentation of melon seeds: 500 g of shelled melon seeds were cleaned, washed in tap water and boiled in about 3L of distilled water for 30 min to soften the seeds and allow for dehulling. The dehulled seeds were boiled again to soften, sterilize, drained and allowed to cool to about 30°C. About 100 g wet weight portions were wrapped in 1% sodium metabisulphite sterilized leaves, covered with cotton/muslin cloth and incubated at ambient temperature (30-32°C) for 120 h. Sampling packages were done so as to allow "a package - a day sampling". Samples were aseptically collected on 24 h basis to determine the effect of fermentation on the melon seeds. A flow chart (Fig. 1) of the processing method is shown below. Production of Ogiri - egusi was by the method described by Asagbra *et al*. (2009).

Proximate analyses: This was determined by the method of AOAC (1990) on Ash, Moisture content, Fat, Protein, Crude fibre, Carbohydrate, Phosphorus, Calcium, Magnesium and Phosphorous.

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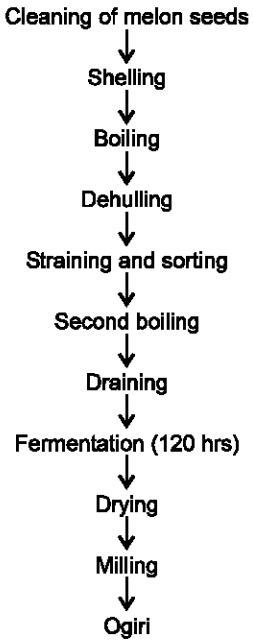

Fig. 1: Flow diagram for Ogiri production

Biochemical analyses

Preparation of soluble extracts: Samples of fermenting melon seeds were collected at different processing periods of 24, 48, 72, 96 and 120 h respectively and dried in hot oven at 60°C to constant weight and then grinded. To 5 g sample in a conical flask was added 70% alcohol solution and the mixture shaken together for maximum extraction. 5 ml of petroleum ether was added to the resulting suspension for oil extraction and then centrifuged at 5000 rpm for 10 min. The clear supernatant was used for analysis.

Determination of pH: This was determined by weighing 1 g of the fermenting mash and suspending it in 9 ml of distilled water. The pH was measured with a Jenway pH meter p165 model 3510.

Determination of soluble sugars: This was carried out by the anthrone reagent method of Morris (1948). To 1 ml of extract from the fermenting mash was added 4 ml of anthrone reagent in a tube. The tubes were heated in a boiling water bath for 10 min and rapidly cooled. The O. D. of the solutions were determined at 620 nm against a reference blank and the amount of sugar liberated was obtained from the standard curve based on known concentrations of glucose.

Determination of total free amino acids: This was carried out by the ninhydrin reaction method of Rosen (1957). To 1 ml of an appropriately diluted extract from the fermenting mash was added 0.5 ml of acetate buffer and 0.5 ml of 3% ninhydrin solution in a tube. The tubes were heated in a boiling water bath for 15 min after which 3 ml of isopropyl-alcohol water mixture was added and the solution rapidly cooled. The Optical Density (O.D) of the solutions were determined at 570 nm against a reference blank and the amount of free amino acids liberated was obtained from the standard curve based on known concentrations of leucine.

Microbiological analyses: This was determined by the method of Harrigan and McCance (1976).

1 g each of the hygienically prepared ogiri and market purchased ogiri were aseptically taken and serially diluted in 9 ml sterile distilled water. Isolation of the organisms was by the pour plate method. At suitable dilutions, 0.1 ml was transferred into a sterile Petridish and molten agar media cooled to about 45°C was poured into the suspension. The mixture was rotated gently to disperse the inoculums in the medium and then allowed to solidify. The plates were incubated at 37°C for 24 h after which all colonies in each plate were counted.

Organoleptic assessment: Evaluation was carried out to determine taste, after taste, flavour, mouth feel and overall quality. The questionnaire used by panelists was prepared using a nine point hedonic scale (Larmond, 1997). Onugbu soup is used for the organoleptic assessment. Onugbu is a traditional/indigenous soup relished and consumed by Nigerians, particularly the igbo speaking tribes of eastern Nigeria. The principal/distinguishing ingredients in onugbu (bitter leaf) preparation is traditional thickner (Edeh), washed bitter leaf i.e the onugbu and ogiri (a fermented condiment). Other components include meat, fish, palm oil, crayfish, water, spices (optional), salt etc.

Onugbu soup is a delicacy normally prepared at homes on special occasions or other important traditional festivals or events.

RESULTS

Table 1 showed the proximate analyses of the two varieties of the melon seeds in the raw and fermented states. Table 2 showed the relationship between pH, soluble sugar and total free amino acids in the market sample of ogiri and the two hygienically prepared ogiri. The market sample ogiri contained pathogenic bacteria; however the hygienically prepared one did not contain pathogenic bacteria. Table 3 indicated the significant differences among the Onugbu soups in taste and overall acceptability.

DISCUSSION

Table 1 shows the result of proximate analyses on the two varieties of melon used for the study. *Cucumeropsis mannii* seed had a higher fat content whilst *Cucumis melo* had higher protein content. Moisture content was

Table 1: Proximate composition before and after fermentation

	Cucumis melo		*Cucumeropsis mannii*	
Parameter (%)	Raw	Fermented	Raw	Fermented
Ash	2.80	1.75	3.13	2.00
Fat	45.65	10.04	55.93	11.81
Protein	30.45	20.06	24.42	18.29
Carbohydrate	16.31	23.43	11.83	23.35
Moisture	4.79	38.72	4.69	44.55
Crude fibre	6.33	13.88	2.60	5.74
Phosphorus (P_2O_5)	0.10	N.D	0.04	N.D
Calcium (Ca)	0.08	N.D	0.06	N.D
Magnesium (Mg)	0.42	N.D	0.52	N.D

Mean values of duplicate experiments. ND: Not Determined

Table 2: Levels of pH, soluble sugar and total free amino acids of Ogiri after fermentation

Ogiri sample	pH	Soluble sugar (mg glucose/g dry wt)	Total free amino acids (mg leucine/g dry wt)
Cucumis melo	8.60	14.2	115
Cucumeropsis mannii	8.66	10.6	135

Table 3: Sensory properties of Nigerian Onugbu soup made with Ogiri from different varieties of melon seeds

	Cucumeropsis mannii	Market place Ogiri	*Cucumis melo*
Colour	$7.8_a \pm 0.55$	$7.4_a \pm 0.29$	$7.1_a \pm 0.96$
Taste	$7.5_b \pm 0.66$	$7.0_{ab} \pm 1.01$	$6.5_a \pm 0.84$
After taste	$7.3_a \pm 0.54$	$7.2_a \pm 0.78$	$6.5_a \pm 0.67$
Flavour	$7.8_a \pm 0.22$	$7.5_a \pm 0.81$	$7.0_a \pm 0.49$
Aroma	$7.7_a \pm 1.23$	$7.0_a \pm 0.71$	$6.9_a \pm 0.64$
Mouth feel	$7.9_a \pm 0.83$	$7.1_a \pm 0.51$	$7.0_a \pm 0.85$
Overall acceptability	$8.0_b \pm 0.62$	$7.2_{ab} \pm 1.00$	$6.7_a \pm 0.47$

Mean values in the same row with same subscript are not significantly different ($p>0.05$)

also higher in *Cucumis melo*. The presence of pathogens in the market ogiri can be attributed to the unhygienic method of preparation (Odunfa, 1983; Achi, 2005).

Table 2 shows the levels of pH, soluble sugar and total free amino acids of Ogiri after fermentation. Both *Cucumis melo* and *Cucumeropsis mannii* had low levels of soluble sugar but high total free amino acid content at the end of fermentation, however, amino acid retention in *Cucumeropsis mannii* was higher. This is in accordance with the work carried out by Omafuvbe *et al.* (2004). However, Ogunshe *et al.* (2007) reported an increasing sugar level with increasing period of fermentation in 'Afiyo' production.

The result of Table 3 indicated that there were significant ($p<0.05$) differences among the Onugbu soups in taste and overall acceptability. The onugbu soup prepared with ogiri from *Cucumeropsis mannii* seeds had significantly higher mean sensory scores than the ones from *Cucumis melo*. There were no significant ($p>0.05$) differences among the soup samples in after-taste, flavour, aroma and mouth feel, however, the soup from *Cucumeropsis mannii* had higher mean score values than the market sample and the *Cucumis melo*.

The higher mean scores of the sensory attributes recorded in the *Cucumeropsis mannii* soup compared to other samples could probably be due to the high fat content and lower protein content of the melon seed used in the preparation of the ogiri compared to those in *Cucumis melo* and market sample.

The higher fat content in *Cucumeropsis mannii* may have contributed to the better taste, flavour and aroma of the onugbu soup prepared with it. According to Odunfa (1983) and Onawola *et al.* (2011) reported that during fermentation, there was evidence of lipase activity which indicate production of free fatty acids. These may react with some other components of the fermenting mash to form esters which produce the characteristic aroma of the food condiments. Oyenuga (1968) reported that high protein content in fermented foods causes increased proteinase activity during fermentation with releases more amino acids and nitrogenous compounds which may probably give odour or smell depending on the fermentation period. The nitrogenous compound produced may thus have affected the taste and overall acceptability of the onugbu soup prepared with Ogiri from *Cucumis melo*.

Conclusion: The onugbu soup prepared with ogiri made from *Cucumeropsis mannii* seeds are more well accepted than those from the market place and *Cucumis melo*.

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