

CAC/IT/NO.12293

# HATMAN

HOSPITALITY AND TOURISM MANAGEMENT  
ASSOCIATION OF NIGERIA

VOL. 11 NO. 1, MAY, 2021

# HATMAN JOURNAL

*of*  
**HOSPITALITY  
AND TOURISM**



# **HATMAN JOURNAL of HOSPITALITY and TOURISM**

publication of

HOSPITALITY and TOURISM MANAGEMENT ASSOCIATION OF NIGERIA (HATMAN).

Registered with the National Library of Nigeria

ISSN:2276-8297 eISSN:2756-4347

url:<https://hatman2010.org/journal/>

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Floor 5, Suit 99, Turaki Ali House (NNDC) 3 Kanta Road, Kaduna, Nigeria.

Website: [www.hatman2010.org](http://www.hatman2010.org)

Telephone: +2348034072296 +2348067992234

Email: [nationalsec@hatman2010.org](mailto:nationalsec@hatman2010.org)

# PACKAGING AND ACCEPTABILITY OF YAM BALL (OJOJO) AMONG VISITORS TO AGODI GARDENS IN OYO STATE, NIGERIA

Apata, O. C\*  
Oyewole, A. R.

**Manuscript History**  
Received: May, 2021  
Revised: July, 2021  
Accepted: October, 2021

University of Ibadan, Ibadan, Oyo State, Nigeria.

\*Corresponding Author: kemiapata2012@yahoo.com

## ABSTRACT

There is a need to enhance and support the implementation of locally made (indigenous) food items and snacks. This can be done by making them more tasty and presentable. Ojojo is a popular delicacy among the Ijebu tribe, of south-west Nigeria, and can be regarded as a savory snack/food. It can be referred to as an underutilized snack due to the fact that it is made from water yam which is underutilized in this part of the world. Indigenous and traditional foods/snacks, if properly utilized could help to solve the problem of poverty, hunger and malnutrition locally, and as such could be promoted to global level. The research was carried out in Agodi gardens located in Ibadan, Oyo state. One hundred and one copies of structured questionnaires (sensory evaluation form) were administered to respondents within Agodi gardens using convenient sampling to assess the organoleptic characteristics, different packaging and overall acceptability of ojojo. The questionnaires were analyzed using descriptive statistics (charts and percentage) and inferential statistics (spearman correlation, t-test, and multiple linear regression. Result from nutritional/proximate analysis revealed that ojojo contains moisture (51.4%), protein (5.9%), fat (8.5%), ash (2.9%), crude fibre (1.1%) and carbohydrate (30.2%). The organoleptic characteristic showed that 58.4% of the respondents liked the taste of the sample, and the mean distribution showed that taste ( $\bar{x}=7.35$ ) ranked highest. The result for the different packaging materials showed that 85.4% liked the sample being served and 61.4% of the respondents preferred plastic pack compared to other packaging materials. The level of acceptability showed that ojojo was well accepted by the respondents as 86.1% of the visitors had above the score of 6 (liked slightly) in the sensory attributes evaluated. Different packaging materials affected the level of acceptance of ojojo among visitors to Agodi gardens. Also the nutritional benefits, taste, aroma, and overall packaging are major predictors of overall acceptability of ojojo.

**Keywords:** acceptability, underutilized indigenous snacks, yam ball, visitors

## To cite this article

Apata, O. C & Oyewole, A. R. (2021). Packaging and Acceptability of Yam Ball (ojojo) Among Visitors to Agodi Gardens in Oyo State, Nigeria. 11(1), 43-47.

## INTRODUCTION

Water yam is the tuber of *Dioscorea alata* also called wild yam and is one of the oldest food crops so far and an important species of the dioscoreacea family (Agwu and Avoaja, 2012). According to Wireko-manu, Ibok, Ellis, and Maziya-Dixon (2013), water yam contains high level of Total Dietary Fiber (TDF) which makes it suitable for management of pile, constipation and diabetes. It is also rich in Vitamin C, beta carotene, vitamin E, calcium, potassium, magnesium, copper and antioxidants. These nutrients are known to play vital role in general body upkeep as well as immune functioning, wound healing, suppression of blood sugar, bone growth and anti-ageing. It is called *Ji abana* in Igbo, *Agbo* in Tiv and *Ewura* in Yoruba land (Okoye, Njoku, and Ugwuanyi, 2018).

Ojojo is a popular delicacy among the Ijebu tribe of south-west Nigeria. Although it was assumed to be underutilized by majority but today Ojojo is consumed in most of the southern parts of Nigeria (Alakali, Okache, and Agomo, 2016). Traditionally, Ojojo is prepared by grating edible portions of water

yam then adding salt and spices such as onion and pepper. It is then mixed thoroughly, scooped with spoon and fried in hot oil, which gives it a striking resemblance to akara balls (Okoye, Njoku, and Ugwuanyi, 2018).

There is a need to enhance and support the implementation of locally made (indigenous) food items and snacks. As there has been a decline in the use of indigenous snacks which has been replaced with modern foods including snacks and cannot be compared to the later in terms of nutritional content (Faber and Wenhold, 2007). This can be done by making them more tasty and presentable. Indigenous and traditional foods/snacks, if properly utilized could help to solve the problem of poverty, hunger and malnutrition locally, and as such could be promoted to global level (Faber and Wenhold, 2007). The goal of food packaging is to contain food in a cost-effective way that satisfies industry requirements and consumer desires, maintains food safety, and minimizes environmental impact (Shaw, 2013). Food is an important component in tourism as it serves as entertainment and cultural activity.

Traditional food and cuisine could be an excellent tourist attraction and an integral part of travel experience to rural travel destinations (EssaysUK, 2018).

## MATERIALS AND METHODS

### Study Area

The research was carried out within Agodi Gardens. Agodi Gardens is located in Ibadan, Oyo state and was established in 1967. It is located between Latitude 7°24' and 7°25' N and longitude 3°53' and 3°57' E (Arowosafe and Ajayi 2018).

### Purchase of Materials

Water yam (*Dioscorea alata*), crayfish, garlic, scotch bonnet (*atarodo*), onions, common salt, seasoning cubes, and groundnut oil were bought from Bodija market, Ibadan, Oyo state

### Preparation of Ojojo

Ojojo was prepared in the Department of Wildlife and Ecotourism Management Laboratory. 1kg of Water yam was peeled and washed/rinsed with water; it was then sliced and grated using the smallest holes of the grater into a bowl. 1 red Onion, 1 stick of spring onion, and 2 scotch bonnet pepper were chopped into smaller bits and added to the bowl of grated water yam. 1 tablespoon of grounded garlic, 2 tablespoon of grounded crayfish, 1 teaspoon of all-purpose seasoning and salt were added into the bowl of grated water yam and mixed together. Oil was heated, and the paste/mixture was scooped into the hot oil and fried.

### Method of Data Collection

The method used for data collection include the preparation of Ojojo samples, the use of questionnaires, sensory evaluation form and laboratory work to analyze the nutritional benefits/composition of the sample.

### Nutritional Composition

The nutritional compositions of the sample were calculated using standard methods as:

#### Moisture content:

$$\% \text{ Moisture content} = \frac{\text{Weight Loss}}{\text{Weight of Sample}} \times 100$$

$$\text{Ash content: Percentage Ash} = \frac{W_2 - W_1}{\text{Weight of Sample}} \times 100$$

**Crude Fat content:** the soxhlets extraction method (AOAC, 1996) was used. The fat extracted from given quantity of sample was then calculated:

$$\% \text{ Fat (w/w)} = \frac{\text{Loss in Weight of sample}}{\text{Original Weight of Sample}} \times 100$$

$$= \frac{W_2 - W_3}{W_2 - W_1} \times 100$$

**Protein content:** it was determined using the Kjeldahl method as described in AOAC (1996).

$$\% \text{ N} = \frac{\text{Molarity of HC1} \times \text{Sample titre} - \text{Blank titre} \times 0.014 \times \text{DF} \times \text{V}}{\text{Weight of sample used}}$$

% N was converted to the percentage crude protein by multiplying by 6.25.

**Crude Fibre content:** calculated using the method described in AOAC (1996).

**Carbohydrate content:** was calculated difference.

$$\% \text{ CHO} = 100 - (\text{Sum of the percentages of moisture, ash, fat, protein and crude fibre})$$

### Sensory Evaluation

Nine point Hedonic Scale was used and the sensory evaluation was carried out by one hundred and one (101) panelists made-up of visitors in Agodi Garden. The attributes that was evaluated were the color, taste, flavour, aroma, texture and overall acceptability.

### Method of Data Analysis

Data collected were analyzed using descriptive statistics in form of charts and percentage, and inferential statistics using spearman correlation, test and multiple linear regression.

## RESULTS AND DISCUSSION

### Nutritional Composition/Proximate Analysis

Nutritional composition of ojojo samples are presented in Table 1. Ojojo sample consists of 51.4% moisture, 5.9% protein, 8.5% fat, 2.9% ash, 1.1% crude fibre shows the results of the chemical properties of Ojojo snacks. Total moisture content ranged from 51.4% to 51.7%, protein content ranged from 5.9% to 6.1%, fat content ranged from 8.5% to 8.4%, crude fibre and 30.2% carbohydrates.

There was slight increase in each of moisture content (ranged from 51.4%-51.7%), protein (ranged from 5.9%-6.1%) and carbohydrate (ranged from 30.2% to 30.3%), while fat (8.5%- 8.4%), ash (2.9%-2.7%) and crude fibre (1.1%-0.8%) decreased and this could be

as a result of other additions such as salt and other spices.

Table 1: Nutritional analysis of *ojojo* snacks

Parameters	Moisture Content %	Protein %	Ether Extract (Fat) %	Ash %	Crude Fibre %	Carbohydrates (By Difference) %
Values	51.4	5.9	8.5	2.3	1.1	30.2
	51.1	5.7	8.7	2.7	1.2	30.6
	51.7	6.1	8.4	2.7	0.8	30.3

Source: Field survey, 2020

**Organoleptic characteristics of *Ojojo***

Figure 1 shows that 58.4% of the respondents liked the taste of the sample, *ojojo*, 21.8% of them did not like the taste, while 19.8% were indifferent about the taste. The mean distribution in Table 2 shows that taste ( $x=7.35$ ) ranked highest among the organoleptic properties of *Ojojo*, this was closely followed by aroma ( $x = 7.33$ ), texture ( $x = 7.14$ ), flavour ( $x = 7.13$ ) while the least was colour ( $x = 6.70$ ). This may be attributed to the spices added in the course of its preparation. This is in line with Romany, Ginon, and Salles (2017) who asserted that when a food is made more palatable by adding salt, spices, herbs, and sweetness people tend to easily accept and consume most of the food that they previously did not prefer consuming. Also each of the sensory attribute (colour, taste, flavor, aroma, and texture)

significantly influenced the acceptability of *Ojojo*.



Figure 1: Percentage distribution of level of likeness of sample tasted

Table 2: Distribution by organoleptic properties and acceptability of *Ojojo* among respondents

	Like extremely	Like very much	Like moderately	Like slightly	Neither like or dislike	Dislike slightly	Dislike very much	Dislike extremely	Mean
Colour	5.0	21.8	39.6	18.8	6.9	5.9	0	2.0	6.70
Taste	14.9	45.5	18.8	14.9	0	2.0	4.0	0	7.35
Flavor	14.9	25.7	37.6	14.9	0	1.0	5.0	1.0	7.13
Aroma	21.8	32.7	20.8	15.6	5.0	2.0	0	2.0	7.33
Texture	19.8	22.8	34.7	12.9	1.0	5.0	1.0	3.0	7.14

Source: Field survey, 2020

**Different packaging materials on the acceptability of *Ojojo***

Figure 2 shows that 85.4% of the respondents liked the sample being served, while 11.9% and 3.0% were indifferent and did not like the sample served, respectively. Figure 3 shows that 61.4% of the respondents preferred plastic pack as means of packaging *Ojojo*, 21.8% preferred foil paper, while 16.8% of the respondents preferred polythene. The rationale behind preference for plastic pack indicated by the respondents was attributed to its neatly packed nature, presentable manner and germs free nature. Those who preferred foil paper were of the opinion that it can easily be microwaved, while those who preferred polythene as a means of packaging *Ojojo* believed it to be handy (Table 3).



Figure 2: Percentage distribution of respondents' likeness of sample before being packed

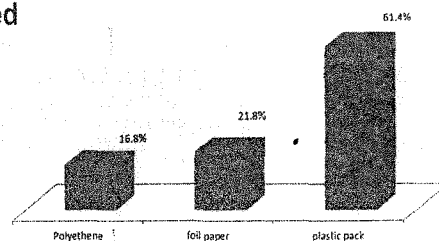


Figure 3: Percentage distribution of preferred material for packaging

Table 3 reveals that 64.7% respondents who preferred nylon as a means of packaging *Ojojo* believed it to be handy, while 35.3% were of the opinion that they can easily view the content when packed in nylon

**Table 3: Distribution by reasons for preference for packaging materials among respondents**

	Frequency	Percentages
<b>Reasons for preferring plastic packs</b>		
Neatly packed	25	40.3
Germ free	13	21.0
More presentable	24	38.7
Total	62	100
<b>Reasons for foil paper</b>		
Easily microwaved	13	59.1
Preserves it	1	4.5
Easy carriage	5	22.7
Neatly packed	3	13.7
Total	22	100.0
<b>Reasons for Nylon</b>		
It is handy	11	64.7
Can easily view the content	6	35.3
Total	17	100.0

Source: Field survey, 2020

The mean distribution in Table 4 shows that plastic (x = 7.33) was the most preferred material for packaging *Ojojo* by the respondents; this is closely followed by foil paper (x = 6.24) and polythene (x = 5.25) Table 4 also shows that 38.6% of the respondents liked the packaging materials very much, 23.8% extremely liked it, 20.8% moderately like it, 13.9% slightly liked it, while 2.0% and 1.0% disliked the packaging materials very much and extremely, respectively

**Table 4: Distribution by respondents' perceived preference for packaging materials**

	Like extremely	Like very much	Like moderately	Like slightly	Neither like or dislike	Dislike slightly	Dislike very much	Dislike extremely	Mean
Polythene	4.0	10.9	22.8	20.8	12.9	5.0	8.9	14.9	5.25
Foil paper	5.0	17.8	25.7	28.7	12.9	2.0	0.0	5.0	6.24
Plastic	19.8	40.6	18.6	8.9	7.9	0.0	1.0	3.0	7.33
Overall packaging	23.8	38.6	20.8	13.9	0.0	0.0	2.0	1.0	7.57

Source: Field survey, 2020

The sensory attributes presented in Table 5 ranges from 1 (Dislike extremely) to 9 (liked extremely). This shows that *Ojojo* was well accepted by the tasters, since the hedonic scale used in the sensory evaluation varied from 9 (liked extremely) to 1 (disliked extremely). This is also evidenced as approximately 86.1% of the respondents had above the score of 6 (liked slightly) in the sensory attributes evaluated.

The study shows that taste, aroma, nutritional composition and overall packaging were major determinants. This implies that consumer's characteristics, sensory attributes and packaging needs to be taken into consideration in making *Ojojo*

a formidable snack to reckon with. This is in congruent with the findings of Maina (2018) who noted that consumer and sensory characteristics constitute key areas in which food manufacturers can successfully use to differentiate their products to help enhance their acceptability.

**Table 5: Distribution by organoleptic properties and acceptability of *Ojojo* among respondents**

	Like extremely	Like very much	Like moderately	Like slightly	Neither like or dislike	Dislike slightly	Dislike very much	Dislike extremely	Mean
Acceptability	20.8	38.6	26.7	9.9	1.0	0	1.0	2.0	7.51

Source: Field survey, 2020

**CONCLUSION**

The study concluded that *Ojojo* is a nutritious snack that is rich in carbohydrate, protein and vitamins, with low fiber. Sensory attributes of *Ojojo* such as colour, taste, flavour, aroma and texture were significantly related to acceptability of *Ojojo* snacks. This suggests that each of this sensory attribute influenced the acceptability of *Ojojo*.

The different packaging was found to be significantly related to acceptability of *Ojojo*. It then implies that packaging materials such as plastic packs, foil paper and polythene influences acceptability of *Ojojo* among visitors.

Visitors to the site showed a level of acceptance to *Ojojo*. Also, taste, aroma, nutritional composition and packaging were major determinants of the acceptability of *Ojojo*. This implies that consumer's characteristics, sensory attributes and packaging needs to be taken into consideration in making *Ojojo* a formidable snack to reckon with.

**RECOMMENDATION**

Further/future research on the Agodi Gardens should not be conducted during the raining seasons and working hours/week days, as this would affect the number of respondents and participation of respondents.

Future researchers to the site should ensure they approach prospective respondents in a good manner and ensure that samples are neatly packed so as to attract more respondents.

The site is a wonderful recreation center for those wanting to participate in recreational activities.

Further research is needed to explore the various ways in which factors that influence food acceptability can be utilized in formulating nutritional and sensory characteristics of food and unconventional snacks

There is a need for further research to establish the

