# Quality Assessment of Processed Garri (White And Red) Sold in Four Different Markets in Rivers State

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***Abstract***

*Study on the quality assessment of different forms of processed garri stored for three months was carried out in the Department of Pant Science and Biotechnology, Rivers State University. The cultural laboratory technique was used for isolation, characterization and determination of fungal incidence. The first month assessment revealed Umiba red samples recorded Penicillium, Microsporium and Aspergilliusflavus at 60%, 30% and 20% incidence respectively while the white samples recorded no fungal organisms. Only Alternaria was observed for the Borri red samples, although the white samples had no contamination. Mgbede samples showed only Fusarium sp to be associated with the white form, while the redgarri had no contamination. Omuetche recorded no fungal isolates for both red and white forms of garri. Month two evaluation showed Ubima red garri to contain Penicillium, Microsporium and A.flavus at 10%, 70% and 20% incidence respectively, whereas the white from recorded no contamination. Omuetche red garri recorded the presence of Rhizopus and Penicillium at 70% and 30% respectively, however the white samples had Mucor (80%) and Candida (20%). Borri recorded only Alternaria for the red samples while no fungal contamination was seen for the white form. Mgbede red samples had no contamination but Fusarium was recorded for the white sample. At month three, Ubima red garri recorded only Aspergillus while Rhizopus (60%) and Candida (40%) were observed for the white samples. Omuetche recorded Rhizopus and Candida for red and white garri respectively. Alternaria and Mucor were recorded for Borri red and white garri respectively. While Fusarium (30%) and Aspergillusfumigatus (70%) were recorded for the Mgbede white garri, no fungal organism was recorded for the red samples. Generally, the different forms of garri obtaianed from various locations had contaminations when stored for three months with an exception for Mgbede red garri.*

***Key words:*** *quality assessment, processed garri, storage*

## INTRODUCTION

A large percentage of people in the majority of West African nations, including Nigeria and Brazil leading the way, consume garri as their primary everyday meal or food of the day. Garri is the most popular of all the products made from cassava. According to Nwakpa (2010), garri is a

form of pre-gelatinized grit that comes in fine and rough particle sizes ranging from below 10 m to over 200 m. It is typically consumed cooked, either as flat soup, dough, or porridge. Indoors, they are made by combining dehydrated garri with water that is either hot or cold, and then eaten with soup or stew. Garri is projected to rule the cassava market in the near future having a proportion of 70% of all fresh root tubers grown (CMP, 2006).

According to Okafor *et al*. (1990), the growth rate of garri has been estimated to be between 4 and 6 percent each year. This growth is mostly attributable to rising urbanization and population expansion, as well as exports to the local West African market. Up to five million Nigerian farmers and producers—typically women—who live in rural regions have already benefited from it, in addition to a sizable number of equipment producers, researchers, suppliers, and merchants. Additionally, in many nations, small-scale Garri processing operations has been the main source of employment.

The following steps are jnvolved in the manufacturing of garri.

i. Peeling: The first procedure is often carried out as soon as the tubers have been brought in by the processor, but no later than two to three days (Onyenwoke *et al*., 2014). Manually removing the rind from the root tubers is done in this procedure using a knife.

The next procedure is washing the root tubers to get rid of the dirt, which is typically in the form of particles of soil attached to the peeled tubers.

ii. Grind the raw tubers into a pulpy substance called mash for simple dewatering. The starch is partially dextrinized after the mashed cassava has been dried and dewatered to a moisture content of around 10% (Osho *et al*., 2002).

iii. The process of fermentation process: This step involves placing the ground cassava mash (pulpy) in a bag, tying the bag, and letting it sit for a few days to remove any excess water and any cyanide content from the starchy meal.

iv. Pulverization: This unit procedure aims to separate the lump that developed during the previous phase.

v. Sieving: This procedure is used to get rid of the grated mash's stiff, uncrushed fibers that were not able to break down during the grating process.
. Frying: By applying heat to the mash to reduce the moisture level, frying turns it into garri.

vi. The garri can be dried outside and packaged then to the cooling and storing procedures.

vii. Cooling and storing: These procedures enable air drying and bagging of the garri. When temperature and humidity levels are over 27 °C and 70%, respectively, garri turns bad (Onyenwoke *et al*., 2014). The level of moisture for garri for optimal preservation is 12.7% (Osunde *et al*., 2011).

## Materials and methods

### Sample Collection

Garri samples (white and oil) used for this study were procured from Omuetche market in Etche local government, market in Ogba/Egbema/Ndoni local government, Ubima market in Ikwerre local government and Bori market in Khana local government all in River State. Four markets were visited in each of these locations and composite samples made to represent the various locations. 10kg each of the representative composite samples were weighed into four transparent poly bags and left in the laboratory for three months from where shelf life determination in terms of nutrient composition and fungal infections were carried out on monthly basis.

### Preparation of media

Sterilization of conical flask, slides, Petri dishes and all the equipment needed for the experiment was carried out in the laboratory. The glass wares were sterilized in the oven at 120$^{o}$C for an hour after washing with soap, while other equipment were surface sterilized with 70% ethanol to reduce microbial contamination (Chuku, 2009). Inoculating loops and scalpels were sterilized by dipping for 20 seconds in 70% ethanol and heated to red hot. The mycological medium used was Sabouraud Dextrose Agar prepared in a conical flask using the standard method. The mouth of the flask was plugged with non-absorbent cotton wool and wrapped with aluminum foil. The conical flask containing the mycological medium was autoclaved at 121$^{o}$C and pressure of 1.1kg cm-3 for 15 minutes. The molten agar was allowed to cool to about 40 $^{o}$ C and dispensed into Petri dishes at 15mls per plate and allowed to further cool and solidify.

### Isolation of fungi from preserved garri

Three fold serial dilution technique was adopted in accordance with the method of Mehrotra and Aggarwal, (2003) where 1g of the stored garri was introduced into the prepared 9ml normal saline and an aliquot inoculated onto Sabouraud Dextrose Agar in Petri dishes onto which ampicillin was added to hinder the growth of bacteria in triplicate. The inoculated plates were incubated for 5 days at ambient temperature of 25$^{o}$ C ± 3$^{o}$ C. The entire set up was observed for 7 days to ensure full grown organisms. Pure culture of isolates was obtained after a series of isolations**.**

### Identification of fungi from stored garri

Microscopic examination of fungal isolates was carried out by the needle mount method (Cheesebrough, 2000). The fungal spores were properly teased apart to ensure proper visibility. The well spread spores were stained with cotton blue-in-lacto phenol and examined microscopically using both the low and high power objective. The fungi were identified based on their spore and colonial morphology, mycelia structure and other associated structures using the keys of (Barnett and Hunter, 1998).

### Determination of fungal percentage incidence

The percentage incidence of fungal occurrence was determined by the formula stated below (Chuku*et al*., 2019):

$$\frac{X}{Y} \times \frac{100}{1} = \% \text{ incidence}$$

Where:

X= total number of each species in a variety

Y= total number of all identified organism in a variety

## RESULTS AND DISCUSSION

**Table 1: fungal incidence of preserved garri for month one**

| Sample Locations | Red garri | | White garri | |
|---|---|---|---|---|
| | **Isolates** | **Incidence %** | **Isolate** | **Incidence %** |
| **UBIMA** | *Penicillium* sp | 60 | NIL | - |
| | *Microsporum* sp | 30 | | |
| | *Aspergillus flavus* | 20 | | |
| **OMUETCHE** | NIL | - | NIL | - |
| **BORI** | *Alternaria* sp | 100 | NIL | - |
| **MGBEDE** | NIL | - | *Fusarium* sp | 100 |

**Table 2: fungal incidence of preserved garri for month two**

| Sample Locations | Red garri | | White garri | |
|---|---|---|---|---|
| | **Isolates** | **Incidence %** | **Isolate** | **Incidence %** |
| **UBIMA** | *Penicillium* sp | 10 | NIL | - |
| | *Microsporum* sp | 70 | | |
| | *Aspergillus flavus* | 20 | | |
| **OMUETCHE** | *Rhizopus* sp | 70 | *Mucor* sp | 80 |
| | *Penicillium sp* | 30 | *Candida* sp | 20 |
| **BORI** | *Alternaria* sp | 100 | NIL | - |
| **MGBEDE** | NIL | - | *Fusarium* sp | 100 |

**Table 3: fungal incidence of preserved garri for month three**

| Sample Locations | Red garri | White garri |
|---|---|---|

| | **Isolates** | **Incidence %** | **Isolate** | **Incidence %** |
|---|---|---|---|---|
| **UBIMA** | *Aspergillus flavus* | 100 | *Rhizopus* sp | 60 |
| | | | *Candida* | 40 |
| **OMUETCHE** | *Rhizopus* sp | 100 | *Candida* sp | 100 |
| **BORI** | *Alternaria* sp | 100 | *Mucor sp* | 100 |
| **MGBEDE** | NIL | - | *Fusarium* sp | 30 |
| | | | *Aspergillus fumigates* | 70 |

Fungi incidence of preserved garri for month one presented in Table 1 showed the occurrence of *Penicillium*sp, *Fusarium* and *Aspergillus flavus* at 60%, 30% and 10% incidence respectively for Ubima oil garri samples while Ubima white garri samples recorded no fungal organism. There were no isolates from oil and white garri samples from Omuetche. *Alternaria* spwasthe only fungal isolate from Bori oil garri at 100% incidence, although no isolate was recorded for Bori white garri sample oil garri recorded no fungal isolate, *Fusarium* sp. was seen in white garri sample at 100% incidence. Generally, garri samples from Omuetche performed better than other samples from other locations as it recorded no fungi isolate at month one of storage..

Fungal incidence of preserved garri for month two presented in Table 2 showed the occurrence of *Pennicillium sp, microsporium sp* and *Aspergillus flavus* at 10%, 70% and 20% incidence respectively for Ubima oil garri sample while Ubima white garri sample recorded no fungal growth. Omuetche oil garri recorded the growth of *Rhizopus*spand *Pennicillium* sp at 70% and 30% incidence respectively while Omuetche white garri showed the occurrence of *Mucor sp* at 80% and *Candida sp* at 20% incidence respectively. Bori oil garri sample recorded *Altenaria sp* at 100% incidence while there was no fungal isolate from Bori white garri sample. The oil garri samples from Mgbede recorded no fungal isolate while Mgbede white garri samples recorded the growth of *Fusarium sp* at 100% incidence. Generally, Ubima, Bori white garri and Mgbede oil garri samples performed better than other garri samples from other locations as they recorded no fungal isolates at month two of storage.

Fungal incidence of preserved garri for month three presented in Table 3 showed the occurrence of *Aspergillus flavus* at 100% incidence while *Rhizopus* spat 60%, *Candida* at 40% incidence for Ubima oil and white garri samples respectively. Omuetche oil garri samples recorded *Rhizopus sp* at 100% incidence while Omuetche white garri recorded *Candida sp* at 100% incidence. Borri oil garri samples recorded *Aternaria sp* at 100% incidence while Bori white garri samples recorded *Mucor sp* at 100% incidence. There was no fungal isolate recorded for Mgbede oil garri samples while Mgbede white garri samples recorded the growth of *Fusarium sp* at 30% incidence and *Aspergillus fumigatus* at 70% incidence.Generally, oil garri samples from Mgbede performed better than garri samples from other locations as it recorded no fungal isolate from month one to month three storage periods.

The result obtained from this study showed that the garri samples collected from four different markets in Rivers state were contaminated by numerous fungi except mgbede oil garri that recorded no fungi contamination. The fungi isolated had various rate of manifestation in the

samples with the presence of *Aspergillus flavus*, *Alternaria sp*, *Mucor sp*, *Fusarium oxysporium*, *Aspergillus fumigatus*, *Microsporum sp*, *Candida sp*, *Rhizopus sp* and *Penicillium sp.* Obadina *et al.,* (2009) have also reported the isolation of the same moulds from their study on garri during assessment of some fermented cassava products. Different authors have been able to isolate and identify a good number of fungi species in garri under different storage conditions (Thomas *et al.,* 2012). Fungal genera such as *Penicillium sp*, *Aspergillus sp*, *Rhizopus sp*, *Alternaria, Mucor sp*, *Fusarium* and *Candida sp,* with high occurrence in oil and white garri could be as a result of them being highly distributed in nature also their ability to survive in many commodities as substrate.

These fungal organisms vary significantly in white and oil garri samples respectively. Fungal isolates obtained from oil garri samples in the first and second month of shelf-life studies were more compared to white garri in this study. This could be that the palm oil used for colour and preservation was contaminated and therefore, increased the growth of fungi. The high number of fungi organisms obtained in oil garri samples during this study does not agree with the report by Onyeke *et al.,* (2010), who reported in his study that fewer colonies of fungi were isolated from yellow garri compared to white garri.

## CONCLUSION

The processed form of cassava (garri) still faces the challenge of spoilage by fungalorganisms. However, this study has shown that processed oil garri has higher shelf life when stored for a period of three months than the white form as it recorded little or no fungal contamination.

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