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THE PREVALENCE OF *Candida albican* IN GARRI SOLD IN OZORO

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ABSTRACT

Garri is a fermented cassava product consumed as a staple food in most parts of West African. The prevalence of *Candidaalbican* in garri sold in ozoro was carried out to characterize predominant fungi associated with garri. Ten (10) different samples of garri were periodically bought from Ozoro central markets. The samples were labeled sample A-J. A total of three (3) fungi species were isolated from the test samples: *Aspergillus spp., Candida albican, and Mould.* The total heterotrophic plate count ranges from $2.4x10^3$cfu/ml to$3.2x10^3$cfu/ml. *Candidaalbican* have the highest percentage occurrence of 62.5%, while Mould species have the least percentage occurrence of 12.5%. The pH of the samples ranged from 6.0 to 6.2. The occurrence of *Aspergillusspp*, mould and *Candidaalbican* indicates a strong likely hood of cross contamination between handling and utensils used during the garri fermentation or production processes of the exterior region.

INTRODUCTION

Nigeria is experiencing increase in population growth. The high population without equivalent increase in food production and availability to the citizens could result to malnutrition, disease outbreak and death. It is an important factor which will need attention by policy makers in Nigeria. Children and lactating mother needs and should be given adequate protein and necessary nutrients or balance diet. According to (Jonathan *et al*., 2011), effect of poor food is termed or known as malnutrition, low productivity level among mothers and children. Among factors affecting inadequate food suffered by citizens is low socio-economic level of the people which is a serious problem. The above problems listed prompted the campaign for increase production, utilization and consumption of traditional foods which includes fresh and processed cassava among the citizens, (FAO, 1998). Cassava tubers consist mainly of carbohydrates (90% of dry weight

basis) (Kay, 1973), 3% protein content and lack cysteine and methionine (Gomez*, et al*., 1985). The cassava leaves, however, are rich in protein; vitamin A and B are commonly consumed as a vegetable by Africans (Anonymous, 2000b and Kimen, *et al*., 2000). Cassava for garri production is harvested manually in the farm with the aid of a cutlass, flat iron steel (digger) and toe that usually inflicts various degrees of injuries on the root tubers of the cassava. After the cassava has been harvested, the root tubers are traveled to the market where they are heaped in 20s, 40s, 50s, 60s, 100s, and above for sales under humid and warm condition of the atmosphere. These practices predispose or exposed the root tubers to contamination and infestation by various groups of micro-organism (fungi) and it may expose public health hazards to citizens. Garri is consumed mainly as a main meal (Eba) or by taking it as a snack by soaking it in cold water with the addition of sugar or salt and groundnut, fried fish e.t.c. Garri is sometimes consumed with milk and beverage. Various groups of microorganism such as bacteria, fungi e.t.c. have been reported to be associated with garri production and storage, also during distribution. Fungi can grow and affect the nutritional and sensory properties or features of garri. Aflatoxins which is produced by fungi genera such as *Aspergillus* and *PenicIlium*. Aflatoxins B_1, B_2, G_1, and G_2 are the most frequently encountered mycotoxins because they are produced by ubiquitous fungi genera.

Some fungi are pathogenic and can cause systemic illness e.g. *Candida sp*. Also, sporogenic fungi when ingested in the garri may come out sporulation to cause illness. In market, garri that is meant to be consumed by the public should be in a safe hand by the manufacturers. Fungi may be multicellular or unicellular (Banwart, 1974). Moulds belonging to the Eumycetes or True fungi whose growth on food is readily recognized by its fuzzy appearance. Yeasts on the other hand are unicellular fungi which are able to reproduce vegetatively by means of simple cells, which bud is commonly divided b fission (Pitt and Hocking, 1997). This study evaluates the prevalence of *Candida albican* on garri sold in Ozoro market.

Materials and Method

Study Area

Ozoro is the headquarters of Isoko North Local Government Area of Delta State. It is one of the administrative units of the Isoko regions in Delta State Nigeria situated at Latitude: 5.5383 and Longitude: 6.2161 with approximate population of 13,411(at 2015) inhabitants and land mass of 1.136km^2. Ozoro falls within the southern tropical evergreen forest zone and characterized by two climatic seasons. It comprises also of commercial activities and other municipal practices which causes environment pollution.

Collection of sample

10 Garri samples were bought from three different locations in Ozoro, Isoko North and Delta state. The samples were collected into sterile polythene and tied properly place of purchase and the samples were labeled A-J. and were transported to the laboratory, where analysis was carried out.

Materials

The material used in this study includes laboratory coat, gloves weighing balance, cotton wool foil paper measuring cylinder (50ml,25oml, 500ml), and beakers (50ml, 200ml,500ml), pipette, petri dishes test tubes conical flask, Bunsen burner, potato dextrose Agar (PDA), wire loop, water etc.

Sterilization of Glasswares

The glasswares that were used for this project were washed with detergent, rinsed thoroughly and sterilized using autoclave at 121^{0}c for 15 minutes.

Method

Isolation of Fungi on Garri

The materials used in this study include laboratory coat, gloves weighing balance, cotton wool, slides, sterile universal container, foil paper, incubator, microscope, measuring cylinder (50ml. 250ml, 500ml), and beakers (50ml, 200ml, 500ml) pipette, Petri dishes, test tubes, conical flask, Bunsen burner, potato dextrose Agar (PDA), wire loop and water.

Preparation of sterilewater

50 milliliters (50ml) of distilled water was pipette into a clean dry test tube plugged with cotton-wool and which was wrapped with aluminum foil. The test tubes were place into an autoclave and sterilized by autoclaving at 121^{0}c for 15 minutes.

Preparation of media

Potato Dextrose Agar (PDA)

Thirty-nine grams (39g) of PDA was weighted into a one (1) liter capacity of conical flask and was boiled and distributed into Mac Conkey bottles and autoclaved for 121^{o}c for 15 minutes.

Sample Preparation

The samples (10g) brought from the market was suspended in a 50ml of sterile distilled water and was homogenized. The samples (A-J) were serially diluted under aseptic condition according to the method of Cheesbrough (2000). 0.1ml of 10^{-2}, 10^{-3}, 10^{-4}, 10^{-5}, 10^{-6} dilutions were transfer to plates of potato dextrose Agar (PDA).

Results and Discussion

Results

The Fungi isolated from the garri samples are *Candida albicans, Aspergillus spp.* and *Moulds.*

Table 4.1: Shows the isolate, Cultural/morphological character

CULTURAL/MORPHOLOGICAL CHARACTER	Isolates
Creamy white colour on SDA	*Candida albicans*
Whitish colour with fuzzy edges on SDA	*Moulds*
Black, white/yellow	*Aspergillus spp.*

Table 4.2.Total Heterotrophic plate count

Samples	CFU/ML
A	$3.2x10^{3}$
B	$2.4X10^{3}$
C	$3.6X10^{3}$
D	$3.3X10^{3}$
E	$2.6X10^{3}$
F	$2.9X10^{3}$
G	$2.7X10^{3}$
H	$3.4X10^{3}$
I	$3.5X10^{3}$
J	$2.8X10^{3}$

Table 4.3 pH of the samples

Samples	pH
A	**6.0**
B	**6.1**
C	**6.1**
D	**6.1**
E	**6.1**
F	**6.0**
G	**6.2**
H	**6.1**
I	**6.1**
J	**6.1**

Table 4.4 Frequency of occurrence of Fungi Isolates

Isolates	No.	% Occurrence
Aspergillius spp.	4	25.0
Candida albican	10	62.5
Mould	2	12.5
Total	16	100

DISCUSSION

These fungi are reportedly common contaminants of agricultural commodities which includes, cereal (cassava tubers, soil and vegetation); Kunene, 1990. The pH of the samples in the present study were similar to the result obtained or achieved by Oyewole (2001) who reported pH to be 6.1. The lower count of Gram-negative fungi spore found in cooked garri and mineral storage at ambient temperature for up to 72hours in other to reduce the microbial population on garri (Holzapfel, 2002). Their presence has been found to survive the high acidic conditions which develops towards the end of fermentation; Oyewole, (2001). This study highlighted that the high microbial number of garri as a source or result of spore forming, catalase positive. *Aspergillus spp*. However, deterioration in culture performance owning/due to one or more of these effects that adversely affects the fermentation process of garri production (Holzapfel, 2002).Mycotoxins, the toxic metabolites of certain fungi (moulds), may cause acute

intoxication and longer term mutagenic, carcinogenic and tetratogenic effect when consumed largely.

Microbial counts of garri powder samples obtained from the three markets in Ozoro (Express market, small market and main market) ranges from $2.4x10^3$ – $3.6x10^3$cfu/ml, which are slightly lower than those found in powered garri samples analyzed by Ofuya, and Akpobi, (1988).Ofuya (2001) reported that fuligo spp (white slime mould) appeared at the beginning of fufu fermentation and became extinct towards the end of the process. Predominant isolate identified from Express market sample were $3.2x10^3$ which reinforce result obtained by Okoli, (1979), Ejiofam and Okafor (1981), Ofuya, and Akpoti, (1988), Amoa-Awua (1996). These microbial counts may have been derived from environments of the processing sites and the market. It is vital that garri should be produced and sold in an environment of high sanitary quality (Ofuya, and Akpoti, 1988). Fungi have been known to cause food borne illness when contaminated food is injected or consumed. (Gilbert and Perry, 1977; Hobbs and Gilbert, 1978 and Gilbert, 1979).

However, the ability of fungi to break down cassava tissue is likely to contribute to the detoxification of cassava during fermentation of garri by bringing about a greater contact between the cyanogenic glucosides and linamarase, which hydrolyses linamarin (Conn, 1969). Previous studies reported that the presence of Alcaligenes (genus of Gram-negative) in cassava fermentation is similar to the garri samples in this study, Oyewole, and Odunfa, 1990).

Relatively high numbers of yeast and moulds, which were not identified in this study, may constitute an additional quality and safety risk in cassava fermentation (Kimayo, *et al.,* 2000). Previous study by Westby and Twiddy (1992), reported the Isolation of fungi (*Aspergillus spp., Mould and Candida albicans*) in characterization of garri and fufu preparation procedure in Nigeria Samples similar to garri power samples analyzed in this study. This could be due to post processing problems, which include handling, air borne contaminants, storage conditions and packaging (Sanni, 1996). Inoculation with starter cultures does not provide an absolute guarantee against failure of fermentation processes; neither does it eliminate health

hazards associated with pathogens, toxinogens, toxic components and residence. LAB and yeast strains associated with fermented foods are capable of degrading anti-nutritional factors such as phylic and phenolic compounds, thus, when incorporated into food fermentation serve to upgrade the nutritional value (Holzapfel, 2002).

These fungi isolated could have got into garri during processing or as a result of being stored in contaminated storage facilities, reported presence of fungi in garri samples collected from various locations in Ozoro and presence of these organisms were attributed to poor handling techniques during processing, transport and storage. High moisture content in garri can be associated with the toasting method. In Ozoro, garri is toasted half way and then sun dried which may not be complete due to sudden change in weather that may lead to packing the garri from the sun. During sun drying, spores of fungi could be deposited on the samples leading to germination when conditions are favorable for the organisms. These organisms are all storage fungi which proliferate when conditions are suitable, so garri sample with high moisture content will lead to proliferation of these fungi.

CONCLUSION AND RECOMMENDATIONS

Conclusion

The microbial average count of the garri analyzed ranges from $2.4x10^3$ to $3.6x10^3$cfu/ml. The significance indicates a strong like hood of cross contamination between handling and utensils used during the garri fermentation or production processes of the exterior region. The identification of randomly selected colonies from spore cont plates of the serial dilution resulted in up to $3.6x10^3$ of colonies identified as *Aspergillus spp, mould* and *Candida albicans*.

RECOMMENDATIONS

It is hereby recommended that the identification of specific strains of pure starter culture for cassava fermentation needs to be obtained in order to determine if higher ethanol concentration would be produced. More work still need to be done or carryout on the production of cassava tubers into garri. And also an investigation on the use of mixed starter culture of ethanol to determine either higher ethanol concentrations would be produced.

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