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Research Article

Analysis of Microbiological Quality of Tapioca (Abaachaa) Sold at Different Bus Stops in Ihiala along Owerri-Onitsha Road

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Abstract

This research work was done to ascertain the bacterial and fungal quality of mixed tapioca popularly called Abaachaa sold at five major bus stops in Ihiala Local government area of Anambra State. The samples were bought and collected from the vendors; mostly women using sterile conical flask. Spread plate technique was done after serial dilution of the samples. The bacterial count on nutrient agar showed 3.8×10^{12}, 7.7×10^{11}, 3.8×10^{12}, 6.7×10^{11}, 5.7×10^{11} cfu/g for Amorka, Uli Center, Total; Post (Okija) bus Stops respectively. Also, bacterial count on MacConkey are 3.5×10^{11}, 7.5×10^{10}, 3.5×10^{11}, 7.5×10^{10}, 6.5×10^{10} were recorded. For the fungal count; 2.7×10^{10}, 7.6×10^{9}, 3.8×10^{10}, 5.6×10^{9}, 7.6×10^{9} were recorded. Some bacterial species like *Bacillus* species; *Staphylococcus* species; *Bacillus subtilis*; *Enterococcus faecalis; Serratia* species; *Escherichia coli* were found. Fugal species like *Rhizopus*, *Penicillium*, and *Aspergillus* species were also isolated. The significance of this study is that it has revealed that the Abaachaa sold at these five bus stops are contaminated and should be eaten with care. Because there was no record of heat treatment in its final preparation both in gravy making and mixing, contamination of the food was noticed. The study recommend that Tapioca (Abaachaa) should be warmed before eaten; though enjoyment of the food is better when taken while it is cold.

Keywords: *Abaachaa; Spread Plate; Serial Dilution; Total-Bacterial; Coliform-Count; Fungal-Cou*nt

Introduction

In Nigeria, cassava tapioca, also known as Abaachaa or Cassava pudding, is an Igbo tribe food made from sliced cassava (also called cassava flakes) combined with various ingredients such as palm oil, garden egg, utazi leaves, onions, grinded crayfish and some other spices. Abaacha is prepared by soaking the tapioca in water and mixing it with special Gravy already prepared. Other things can be added per consumer's taste. As vendors move around selling it, there is the tendency that contamination will take place. Microbial assessment of this mixed cassava tapioca is essential to understand the bacterial diversity, potential of pathogens and organisms responsible for spoilage that may be associated with the dish [1]. Microbiological analysis and assessment are a fundamental aspect of food safety assessment, that helps identify and mitigate potential risks associated with microbial contamination in food products. It is known for its unique spicy and tangy flavor [2] or as a side dish to the various Nigerian rice recipes [3]. It is usually prepared by soaking the tapioca in water and mixing it with special Gravy already prepared. Other things can be added per consumer's taste [7]. As vendors move around selling it, there is the

tendency that contamination will take place. Microbial assessment of this mixed cassava tapioca is essential to understand the bacterial diversity, potential of pathogens and organisms responsible for spoilage that may be associated with the dish. Microbial assessment of this mixed cassava tapioca is essential to understand the microbial diversity, potential pathogens and spoilage organisms that may be associated with the dish [4]. Microbiological analysis and assessment are a fundamental aspect of food safety assessment, enabling the identification and mitigation of potential risks associated with microbial contamination in food products. Traditional dishes hold cultural and culinary significance across the globe, and "Africa Salad" stands as a prime example, celebrated for its blend of flavors and regional ingredients [2].

Methodology

Area of study and setting

The areas of study for this research are five major bus stops in Ihiala Local Government Area of Anambra State; along Owerri Onitsha Road. These areas are located in the South-East region of Nigeria.

Collection of sample

This Cassava Tapioca puddings were purchased at random from different vendors in five different bus stops namely, Amorka, Uli Center, Total, Ezego and Okija (Post) bus stops all in Ihiala Local Government Area of Anambra State. The samples were collected using sterilized conical flask. The vendors were asked to transfer the well mixed Cassava Pudding (Abaachaa) into the already sterilized flask. The samples were transported to Legacy University Okija Microbiology Laboratory within 45 minutes of collection for analysis.

Analysis of sample and isolation of pure culture

The media used for this analysis are nutrient agar for enumeration of total colony count, MacConkey agar for the enumeration of coliform count and Sabouraud dextrose agar for the enumeration of fungal count. They were all prepared per manufacturer's instructions and directions. Ten-fold serial dilution was done and spread plate technique for isolation was adopted using 10^{-3}, 10^{-4} and 10^{-5} diluents. Nutrient and MacConkey plates were incubated for 24hrs at 37°C while that of sabouraud dextrose agar were incubated for 2 - 5 days at 37°C [4].

Identification of the isolates

The isolates from the incubated plates were obtained by sub culturing them on freshly prepared nutrient agar and stored in agar slants at 4°C. The results of the Identification were presented in tables below.

Results

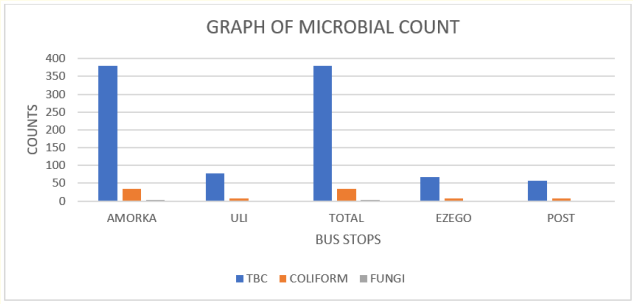
The results showed that there are possibilities of contamination of this food samples. Various types of bacteria, fungi and possibly other microorganisms were isolated and identified. All the samples had bacterial and fungal counts above the tolerable 10^6 limit in foods.

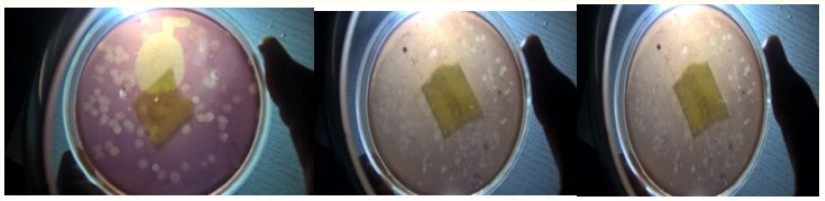
Table 1 shows the bacterial and fungal counts of isolates from the different samples. It results indicates the presence of *Bacillus*, *Staphylococci*, *Escherichia coli*, *Enterococci* and *Serratia* species. The fungal spp isolated include *Saccharomyces* species, *Mucor* species, *Rhizopus* species, *Penicillium* species, and *Aspergillus* species.

Samples site	Nutrient Agar		MacConkey Agar		SDA	
AMOK	3.8×10^{12}	380	3.5×10^{11}	35	2.7×10^{10}	2.7
ULI	7.7×10^{11}	77	7.5×10^{10}	7.5	7.6×10^{9}	0.76
TOTAL	3.8×10^{12}	380	3.5×10^{11}	35	3.8×10^{10}	3.8
EZEGO	6.7×10^{11}	67	7.5×10^{10}	7.5	5.6×10^{9}	0.56
POST	5.7×10^{11}	57	6.5×10^{10}	6.5	7.6×10^{9}	0.76

Table 1: *Total bacterial count in cfu/g of samples.*

AMOK: Amorka Bus Stop; ULI: Uli Center Bus Stop. k; TOTAL: Total Bus Stop; EZEGO: Ezego Bus Stop; POST: Okija Bus Stop.





Figure

Discussion

This research showed that apart from the initial boiling cassava before slicing, no record of heating is involved. The high level of colony counts recorded could be that this food product is consumed raw with no heating or warming as reported by [8]. The addition of fermented products like 'Ugba' and 'Ogiri' could have contributed immensely to the high microbial load [2]. Other organisms also isolated from 'Ugba' and 'Ogiri' include *Pseudomonas, Staphylococcus, Enterobacters, Leuconostoc, Corynebacterium, Proteus, E. coli* and *Alcaligenes* [3]. The women that are involved in the preparation of the special gravy, mixing, and washing of cassava also contribute to the contamination of this food samples. The pot, spoon, knife and other utensils do not receive any sterilization process. Even the water for processing and preparation are not sterilized. The addition of fermented products like 'Ugba' and 'Ogiri' could have contributed immensely to the high microbial load [5]. Other organisms also isolated from 'Ugba' and 'Ogiri' include *Pseudomonas, Staphylococcus, Enterobacters, Leuconostoc, Corynebacterium, Proteus, E. coli and Alcaligenes* [6].

The entire product is often left unpreserved, unsterilized and at the room temperature of the day. The gravy is normally prepared early in the day and hawked throughout the day. Whenever the food is displayed moved around for sales, the product is opened as often as possible to attend to customers; this practice could contribute to contamination of the food [4].

Conclusion

The importance of this study is that it has revealed that the Abaachaa sold at these five bus stops are contaminated and should be eaten with care. The following confirmed that the samples are not potable as the bacterial count on nutrient agar showed 3.8×10^{12}, 7.7×10^{11}, 3.8×10^{12}, 6.7×10^{11}, 5.7×10^{11} cfu/g for Amorka, Uli Center, Total; Post (Okija) bus Stops respectively. Also bacterial count on MacConkey are 3.5×10^{11}, 7.5×10^{10}, 3.5×10^{11}, 7.5×10^{10}, 6.5×10^{10} were recorded. For the fungal count; 2.7×10^{10}, 7.6×10^{9}, 3.8×10^{10}, 5.6×10^{9}, 7.6×10^{9} were recorded. This research work on Mixed Tapioca (Abaachaa) has enhanced our understanding of the microbial composition of it. It has revealed to why and how this food product is contaminated. As reported by [12], this study has also shed light on safety concerns related to the presence of pathogenic bacteria, fungi and the importance of proper food handling and preparation practices. The condiments added to this food and in its preparation will showcase the composition of the product and to a large extent the indigenous bacteria [11]. High moisture content encourages microbial growth on food materials, the high moisture content of African salad also will make its preservation difficult. [7]. High lipid content with high moisture increases the chances for rancidity in any food and it reduces the shelf life of food samples [9]. The low ash content shows low mineral content. Ash content of a food product influences its quality [10]. On the future scope of this study, though the food is better eaten and enjoyed in cold form. Extra special precaution must be taken in its preparation even at the gravy preparation stage as pathogenic bacteria could be introduced through the ingredients used. This research work has shown that this food has many ways it can be contaminated. We recommend that it should be parboiled before eating. Awareness and education on food processing and for vendors should be considered of paramount importance.

Conflict of Interest

Though this work showed that the Abaachaa sold in these five bus stops are contaminated, it doesn't generally hold for all Abaachaa sold in other areas. As the personnel and utensils used in preparation vary from one vendor and location to another. Contrary to wild believe in traditional igbo land that palm oil has bactericidal effect on microbe. Their presence in the gravy, didn't do much.

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Author's Contributions

The authors are microbiologist. They contributed wealth of their knowledge to this research work.

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