

Enumeration and Identification of Bacteria Commonly Associated with Overripe Plantain

Olagoke^{1*}, O.V., Oyewale², O.O., Olakanmi², E.O., Jimoh¹, J.O

¹Department of Agricultural Development Management, Agricultural and Rural Management Training Institute (ARMTI) Ilorin.

²Department of Rural Development and Gender Issue, Agricultural and Rural Management Training Institute (ARMTI) Ilorin.

*Corresponding Author: Olagoke, Department of Agricultural Development Management, Agricultural and Rural Management Training Institute (ARMTI) Ilorin.

ABSTRACT

There are increasing reports of food poisoning due to methods used for processing certain food items in most parts of Africa especially in Nigeria. Also, very little information is available on bacteria counts of over ripe fried plantain (Dodo-Ikire) locally produced among the indigenes of Ikire town and sold in some parts of Western States of Nigeria. This study enumerates and identified bacterial isolated from over ripe fried plantain. The samples were obtained from two vendors in Ikire and Ibadan. Among the samples obtained, the bacterial counts of Dodo Ikire purchased from Ikire town ranged between 1.5×10^5 and 7.1×10^6 cfu/g which had moderate bacterial counts compared with samples purchased from Ibadan with higher bacterial counts ranged between 6.2×10^7 and 9.0×10^8 cfu/g. The study also discovered that the predominant bacterial are *Klebsiella pneumoniae*, followed by *Staphylococcus aureus* as well as *Bacillus subtilis* and lastly *Pseudomonas aeruginosa*. The study concluded that the significant higher values of bacterial counts obtained in the samples employed indicated poor hygiene practices by the producers and the vendors. Also, this study suggested that improvement should be made on proper hygiene practices in both the production and the packaging process of the products as well as restriction of vendors from hawking Dodo Ikire in densely populated areas of both the city and the town in order to minimize bacterial contamination.

INTRODUCTION

Plantain (*Musa sapientum* var. *Paradisical* Linn) is one of the most important staple food crops for millions of people both in developed and developing countries (Oriola *et al.*, 2017). Plantain cultivation is attractive to farmers due to low labour requirements for production compared with cassava, maize, rice and yam (Marriott and Lancaster, 2003). It therefore contributes significantly to food and income security of people engaged in its production and trade, particularly in developing countries (Simmonds, 2006). In Nigeria, its consumption cuts across the indigenous groups and the numerous socio-economic classes because of the ease of preparation and consumption (Solanke and Falade, 2010). Over 2.11 million metric tons of plantains are produced in Nigeria annually which contributes substantially to the nutritional of subtropical local population (Akinsanmi, 2015). Plantain flowers, ripe fruit, unripe fruit, leaves and stem extract and its active constituents have

been used for the treatment of a large number of human ailments (Auta and Kumurya, 2015). Plantain being a climacteric fruit, when harvested at the pre-climacteric matured green stage, the fruit undergoes various physiochemical changes such as composition, colour, texture, aroma and taste, pertaining to changes in metabolic rates and biochemical reactions like respiration, ripening and senescence in the climacteric phase (Adeyemi and Oladiji, 2009).

Plantain has diversity of minerals, it is high in potassium, low in sodium (17 mg/100g) and fat (0.1%) making it suitable to control blood pressure (Kanazawa and Sakakibara, 2000; Mohapatra *et al.*, 2010). It is often recommended to be consumed by people who are intolerant to salt. Many nutritive minerals are essential to living organisms because they are use to activate hormone, enzymes, and other organic molecules that participate in the growth, function and maintenance of life processes (Aslam *et al.*, 2005). Minerals cannot be synthesized and must

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be provided from plants, vegetables or mineral rich water (Adewusi *et al.*, 1999). The consumption of plantain promote weight loss in obese individuals and caters to the calorific need of many developing countries (Kanazawa and Sakakibara, 2000; Mohapatra *et al.*, 2010). Many products have been commercially produced from plantain fruits such as chips, flour, beer and beverage drink (Casimir and Jayaraman, 2001). A typical staple snack produced in some Western States of Nigeria is called Dodo Ikire which originated from Ikire town in Osun State, Nigeria. There is dearth of information on the bacteria counts of Dodo Ikire (over ripe fried plantain) in the region. Hence, this study intends to enumerate the bacteria count, isolate and identify bacteria isolated from Dodo Ikire.

MATERIALS AND METHODS

Collection of Samples

The samples (Dodo Ikire) were bought from two vendors in different locations in Ikire and Ibadan to be precisely. The samples were brought to the laboratory for analysis under aseptically condition with proper labeling to avoid cross contamination.

Bacterial Counts

Bacterial counts were carried out by the method described by Jonathan and Olowolafe (2001). One gram for each sample was suspended separately in 10ml of sterile distilled water and later diluted to obtain a three-fold diameter petri-dish containing sterilized nutrient Agar. After then 0.1ml of the 10^{-3} suspension was

seeded into another petri-dish and overlaid with nutrient Agar. These were then incubated at 37°C for 24hours followed by the count of total number of colonies that developed using a colony counter model.

Isolation of Bacterial

The streak plate method was used for isolation. The flamed inoculating loop was used to pick a selected colony and then streak the surface of already solidified nutrient agar and thereafter incubated 37°C for 24hours.

Bacterial Characterization

The colonies of isolates resulting from the Isolation were sub-cultured on mannitol salt agar, eosin methylene blue agar and MacConkey agar. The Gram staining was done and cultural characterization of the isolates on the plate was observed as well as biochemical tests.

Result

The mean bacterial count is shown in table 1. The profile of bacterial mean count of samples purchased from Ikire ranges from 1.5×10^5 to 7.1×10^6 cfu/g which had moderate bacterial counts compared with samples purchased from Ibadan with higher bacterial counts ranges between 6.2×10^7 and 9.0×10^8 cfu/g. A total of 25 bacterial isolates were recovered from over ripe fried plantain samples with Predominant organisms of *Klebsiella pneumoniae* which categorized as group A, followed by *Staphylococcus aureus* as group B, followed by *Bacillus subtilis* as group C and lastly *Pseudomonas aeruginosa* as group D (Table 2)

Table 3.1. Profile of Bacterial Mean Count

Samples Location	Bacterial Count
Ikire	1.5×10^5 - 7.1×10^6
Ibadan	6.2×10^7 - 9.0×10^8

Table 3.2. Distribution of Bacterial Isolates among Samples

Organisms	Samples	
	IK	IB
<i>Klebsiella pneumonia</i>	4	6
<i>Staphylococcus aureus</i>	3	3
<i>Bacillus subtilis</i>	1	3
<i>Pseudomonas aeruginosa</i>	-	1

DISCUSSION

The results obtained from plate count shows that Ibadan samples had higher count than that of Ikire (Table 1). *Klebsiella pneumoniae* was the most predominant bacteria isolate b encountered. Nsciler (2000), reported that *Klebsiella* species are found in a broad range of commercial foods including meat and meat products, poultry, egg

products, salads, Bakery products, sandwich fillings milk and dairy products which also in accordance in this study. Meanwhile, food products that require considerable handling during preparation or are kept at slightly elevated temperatures after preparation are frequently involved in *Klebsiella* food poisoning (FDA, 2012).

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Klebsiella pneumonia was the first to *Staphylococcus aureus* in predominance and it was highest in Ibadan samples. *Pseudomonas aeruginosa* is a gram positive non sporulated rod that is also present in soil and dust. Its occurrence shows 25% in Ibadan sample and 0% in Ikire samples. The *Klebsiella pneumonia* and *Staphylococcus aureus* shows the highest prevalence of 47.6% and 28.6% respectively. The study shows that the organisms are probably gotten from handlers during the selling of products as they could touch their nostrils and peradventure the processing room is contaminated. The presence of *B. subtilis* during the production of Overripe Plantain (Dodo-Ikire) may be due to contamination through their endospores from dust, air and peels. Bacilli are spore forming bacteria, able to withstand harsh conditions which are widely distributed in nature and in many cases with a pH as low as 3.9. The factors that contributed to higher bacteria count values of this product may be due to the unhygienic practices of the vendors, contamination due to population congestion in the market locations, use of unsuitable material for packaging and contamination of the final product during hawking.

CONCLUSION

The study concluded that the higher number of bacterial is alarming as the international microbiological standard specify that bacterial plate count should be less than 10^5 CfU/g of coliform and should not exceed the range of 10^1 - 10^2 cfu/g but this study recorded high bacteria count. However, the need for improved good hygiene practices should not be ruled out. The higher bacteria load recording from the products are not only the indication of deteriorate but also a warning sign of the presence of many pathogenic organisms. Clean environment will play an important and vital role. Therefore, it is recommended for strict monitoring and certification of the processing hoping to maintain quality of product and ultimately to ensure good health.

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