



## Bacteriological Status of Water Melon (*Citrullus Lanatus*) Sold in Mile III Market, Port Harcourt

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### ABSTRACT

The study was carried out to investigate the bacteriological status of freshly sliced water melon in mile III market Port Harcourt. A total of 20 sliced water melons was collected while one whole water melon collected was used as control in this study. The control sample was properly washed with sterile water and sliced aseptically. A sterile knife was used to cut 1.0g from each water melon sample and homogenized on a sterile mortar and pestle. The resultant homogenate was pipette (1.0ml) into 9.0ml of distilled water and serially diluted. The 10<sup>4</sup> dilution was plated out on Nutrient and MacConkey agar plates respectively using spread plate technique. The plates were incubated at 37<sup>0</sup>c for 24 hours. The cultured plates were examined for colony growth and identification of isolates. The result showed that bacteria isolated from the sliced water melon were *Staphylococcus aureus*, *Escherichia coli*, *Bacillus* spp and *Proteus* with percentage bacterial count of 414 (45.8%), 324 (35.5%), 144 (15.8%), and 30 (3.3%.) respectively. The control sample showed a scanty growth of *staphylococcus aureus*. In conclusion, since the control had only a colony of *staphylococcus* on culture plate after it has been hygienically processed, contamination of the sliced water melon maybe due to poor sanitary condition employed by the vendors during processing and packaging. This is of public health concern as these organisms are known causes of food born diseases and food poisoning.

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### Introduction

Over the years, there has been a significant increase in the consumption of sliced fruits produce because they are easily accessible, convenient, nutritious and mostly cheaper than the whole fruits or vegetable (1). This increase in the consumption of sliced fruit has been linked with a parallel increase in food borne illness (2). Sliced fruits commonly consumed in Nigeria include paw-paw, pineapple, water melon and salad vegetable.

Watermelon is usually produced in the northern states in Nigeria and brought to the markets where it is bought and usually sliced, packaged in transparent white polyethylene bags and sold in the market. The increased consumption, coupled with the associated risk of disease to which consumers may be exposed to be a matter of great concern. It is difficult for one to attest the hygiene of the processors and sanitary conditions at points of preparation (3).

Moreover, the case is worsened by the fact that sliced water melon vending is done without adequate storage conditions, thereby exposing the sliced water melons to flies and other disease causing agent. It is mostly sold by unlicensed vendors with poor education levels and untrained in food hygiene (4; 5). The consumption of sliced water melon may thus potentially increase the risk of food borne disease due to a wide variety of pathogens (6). There are different sources of microbial invasion of sliced produce. Pathogens may invade the interior surface during peeling, trimming and other processes like packaging, handling and marketing (7).

Market vendors usually make use of simple facilities like wheel barrows, trays, tables thus further increasing the risk of food contamination due to the fact that these are not washed or

sterilized after they have been used for earlier sales or storage condition and sites of these facilities are contamination or cross contamination of market foods, especially sliced fruits and vegetables and preservation methods (8). The use of dirty utensil, as well as the open display of food encourages sporadic visits by flies, cockroaches, rodents and dusts (9). Preservation of sliced fruits and vegetables that require no future processing before consumption at ambient temperatures during retailing maintains the produce at optimum temperature of invasion by pathogenic mesophiles (10). Another major source of contamination of fresh fruits and vegetables sold by market vendors is the washing water (11). Poorly processed market produce have been identified as an important cause of death in developing countries (2).

Bacteria like *Salmonella* spp, *Shigella* spp, *Campylobacter* spp and *Escherichia coli* can contaminate sliced fruits and vegetables through contact with sewage and contaminated water (12).

A good and acceptable reasons for carrying out this research is to create awareness to both hawkers/vendors, consumers and the general public on the various bacterial pathogens associated with this sliced produce and its public health implications when it is not properly handled and also to make meaningful suggestions to lasting solution to the problem. Therefore this work was aimed at assessing the bacteriology quality of sliced water melon sold in mile III market.

## Materials and Methods

### Study Area

Mile III market, Port Harcourt metropolis in Rivers State was used as the study area. Sliced water melon from various site were bought and examined bacteriologically.

### Sample Collection

Twenty different samples of packaged sliced water melon and a whole uncut water melon (control) were purchased in mile III market Port Harcourt. The sliced water melon were transferred in a cool container to the laboratory and analyzed within 2 hours after collection.

### Method of Analysis

The control sample was properly washed sterile water in aseptic condition and sterile knife was used to cut 1.0g from the water melon. Sterile knife was also used to cut 1.0g from each sliced water melon sample and homogenized was pipette (1.0ml) into 9.0ml of distilled water thus, serial dilution was done and the  $10^4$  dilution was plated (0.1ml) out on nutrient agar and MacConkey agars respectively. Using the spread plate technique, the plates were incubated at  $37^\circ\text{C}$  for 24 hours. After the period of incubation, the culture plates were examined for colony growth and identification of possible isolates.

### Identification of Isolates

Isolates were identified using cultural and biochemical characteristics while colonies on agar plates were counted.

### Results

Table 1 below shows the total viable bacterial count of each sample (cfu/g). sample 1 ( $3.8 \times 10^4$ ), sample 2 ( $1.1 \times 10^4$ ), sample 3 ( $2.6 \times 10^4$ ), sample 4 ( $7.3 \times 10^4$ ), sample 5 ( $2.4 \times 10^4$ ), sample 6 ( $1.5 \times 10^4$ ), sample 7 ( $9.0 \times 10^4$ ), sample 8 ( $4.9 \times 10^4$ ), sample 9 ( $5.5 \times 10^4$ ), sample 10 ( $11.2 \times 10^4$ ), sample 11 ( $2.6 \times 10^4$ ), sample 12 ( $2.1 \times 10^4$ ), sample 13 ( $7.3 \times 10^4$ ), sample 14 ( $5.8 \times 10^4$ ), sample 15 ( $6.0 \times 10^4$ ), sample 16 ( $1.9 \times 10^4$ ), sample 17 ( $7.0 \times 10^4$ ), sample 18 ( $5.8 \times 10^4$ ), sample 19 ( $4.7 \times 10^4$ ) and sample 20 ( $1.1 \times 10^4$ ). The highest bacterial count was found in sample 10 and the lowest was found in samples 2 and 20.

Also *Staph aureus* 13(34.2%), *E.coli* 25(65.8%), *Bacillus* 0(0%), *proteus* spp 0(0%). Sample 2 *Staph aureus* 6(54.5%), *E.coli* 5(45.5%), *Bacillus* 0(0%), *proteus* spp 0(0%). Sample 3 *Staph aureus* 11 (44.3%), *E.coli* 15(57.3%) *bacillus* sp 0(0%), *proteus* sp 0(0%). Sample 4 *Staph aureus* 67(91.8%), *E.coli* 0(0%), *Bacillus* spp 6(8.2%), *Proteus* spp 0(0%). Sample 5 *Staph aureus* 9(35.5%), *E.coli* 15(63.5%), *Bacillus* spp 0(0%), *Proteus* spp 0(0%), Sample 6 *Staph aureus* 0(0%), *E. coli* 0(0%), *Bacillus* spp 10 (66.7%), *Proteus* spp 5(33.3%), Sample 7 *Staph aureus* 5(5.6%), *E.coli* 85(94.4%), *Bacillus* spp 0(0%), *Proteus* spp 0(0%), Sample 8 *Staph aureus* 34(69.4%), *E.coli* 0(0%), *Bacillus* spp 15(30%), *Proteus* spp 0(0%). Sample 9 *staph aureus* 14(25%), *E.coli* 41(36.6%), *Bacillus* spp 0(0%), *Proteus* spp 0(0%), Sample 10 *Staph aureus* 0(0%), *E.coli* 71(3.4%), *Bacillus* spp 41(36.6%), *Proteus* spp 0(0%), Sample 11 *staph aureus* 0(0%), *E.coli* 0(3.4%), *Bacillus* spp 26(100%), *Proteus* spp 0(0%), Sample 12 *staph aureus* 0(0%), *E.coli* 15(71.4%) *Bacillus* spp 6(28.6), *Proteus* spp 0(0%), Sample 13 *staph aureus* 58(79.5%), *E.coli* 0(0%), *Bacillus* spp 0(0%), *Proteus* spp 15(0%). Sample 14 *staph aureus* 50(72.5%), *E.coli* 0(0%), *Bacillus* spp 19(27.5%), *Proteus* spp 0(0%), Sample 15 *staph aureus* 35(58.3%), *E.coli* 15(25%), *Bacillus* spp 0(0%), *Proteus* spp 10(16.7%). Sample 16 *staph aureus* 0(0%), *E.coli* 19(100%), *Bacillus* spp 0(0%), *Proteus* spp 0(0%), Sample 17 *staph aureus* 60(85.7%) *E.coli* 0(0%), *Bacillus* spp 16(14.3%), *Proteus* spp 0(0%), Sample 18 *staph aureus* 40(69.0%) *E.coli* 18(31%), *Bacillus* spp 0(0%), *Proteus* spp 0(0%), Sample 19 *staph aureus* 17(6.2%), *E.coli* 30(63.8%).

*Bacillus* spp 0(0%), *Proteus* spp 0(0%). Sample 20 *staph aureus* 0(0%), *E.coli* (0%), *Bacillus* spp 11(100%), *Proteus* spp (0%) control sample *staph aureus* 1(100%), *E.coli*, *Bacillus* spp 0(0%), *Proteus* spp (0%). *Staph aureus* had the highest number while *proteus* had the lowest number of organism shows total number of isolated bacteria species from sliced water melon samples. *Staphylococcus aureus* 414 (45.4%) *Escherichia coli* 324 (35.5%), *Bacillus* spp 144 (15.8%) and *proteus* spp 30 (3.3%). The result shown that *staphylococcus aureus* was the highest bacteria species isolated from sliced water melon.

### Discussion

Different bacteria organisms were isolated from sliced water melon sold in mile III market. The presence of these organisms may be as result improper handling, use of contaminated water during washing or the use of dirty utensils like knives and trays during the cutting processes (9,11). the study revealed that sliced water melon samples gotten from mile III market had bacterial growth but the microbial load of the sliced water melon were not the same, some were higher than others to the extent that it may pose a threat to the health of regular consumer.

There were a total of 4 (four) genera of micro organisms isolated these include *staphylococcus aureus* 414(45.4%), *Escherichia coli* 4(35.5%), *Bacillus* spp 144 (15.8%) and *proteus* species 30(3.3%) this support agrees to report of (11) as they isolate most similar organisms from chicken pies, and sea foods. the organisms isolated were mostly coliform such as *Klebsiella* species, *proteus* species and *Escherichia coli*. Coliforms are mainly found in water soil and faecal matter as they are widely distributed in water, soil and vegetation (13). The presence of these organisms in fruits produce shows state of low level of hygiene and sanitary practices employed in the processing and packaging of this fruit produce (7).

The identification of the isolated bacteria showed that they were contaminated with mostly *staphylococcus aureus* which is a gram positive bacteria, They produce enterotoxins that can withstand temperature which on ingestion can cause vomiting and diarrhea (14).

The presence of *staphylococcus aureus* in these sliced water melon might have been as a result of poor hygiene from the body of the vendor transferred since *staphylococcus* is normal flora found on the body of human beings.

*Escherichia coli* also has an occurrence of 22.7% *Escherichia coli* is an aerobic as well as anaerobic bacteria that grows at  $36^0$ - $37^0\text{C}$  with moist strains growing over the range of  $10$ - $44^0\text{C}$ . *Escherichia coli* is a normal colonist of the human gastrointestinal tract (G.I.T.) but may occasionally be associated with diseases in humans. *Escherichia coli* is a strong indicator of fecal contamination. Thus foods may be contaminated through sample like (feces and urine and contaminated hands from toilet).

*Bacillus* species occurrence was about 24.3%. The public health significance of *bacillus* spp is of high concern in view of the organism being implicated in a number of food poisoning outbreaks. The isolated *bacillus* species from sliced water melon should be explained by the ubiquitous distribution of this organism and its ability to form endospores (15). the principal source of these organism is from unsterilized or poorly sterilized slicing and vending materials Other species are saprophyte found in the soil, water, vegetation and food stuff such as meat, milk and species.

*Proteus* species occurrence was about (8.2%) they are part of the *entrobacteriaceae* family of gram negative motile swarmer bacteria.

**Table 1. Total Viable Bacterial Count and Bacterial Species from Water Melon Sample**

Samples	Total Viable Count (cfu/g)	Staphylococcus aureus	E.coli	Bacillus Spp	Proteus Spp	Total
1	3.8x10 <sup>4</sup>	13 (34.2)	25 (65.8)	0(0.00)	0(0.00)	38 (100%)
2	1.1x10 <sup>4</sup>	6 (34.5)	5 (45.5)	0(0.00)	0(0.00)	11 (100%)
3	2.6 x10 <sup>4</sup>	11 (42.3)	15 (57.3)	0(0.00)	0(0.00)	26 (100%)
4	7.3 x10 <sup>4</sup>	67 (91.8)	0(0.00)	6 (8.2)	0(0.00)	73 (100%)
5	2.4 x10 <sup>4</sup>	9 (35.5)	0(0.00)	0(0.00)	0(0.00)	24 (100%)
6	1.5 x10 <sup>4</sup>	0(0.00)	0(0.00)	10 (66.7)	5 (33.3)	15 (100%)
7	9.0 x10 <sup>4</sup>	5 (5.6)	85 (94.4)	0(0.00)	0(0.00)	90 (100%)
8	4.9 x10 <sup>4</sup>	34 (69.4)	15 (30.6)	0(0.00)	0(0.00)	49 (100%)
9	5.5 x10 <sup>4</sup>	14 (25.5)	41 (74.5)	0(0.00)	0(0.00)	55 (100%)
10	11.2 x10 <sup>4</sup>	0(0.00)	71 (63.4)	41 (36.6)	0(0.00)	112 (100%)
11	2.6 x10 <sup>4</sup>	0(0.00)	0(0.00)	26 (100%)	0(0.00)	26 (100%)
12	2.1 x10 <sup>4</sup>	0(0.00)	15 (71.4)	6 (28.6)	0(0.00)	21 (100%)
13	7.3 x10 <sup>4</sup>	58 (79.5)	0(0.00)	0(0.00)	15 (20.5)	73 (100%)
14	5.8 x10 <sup>4</sup>	50 (72.5)	0(0.00)	19 (27.5)	0(0.00)	69 (100%)
15	6.0 x10 <sup>4</sup>	35 (58.3)	15 (25)	0(0.00)	10 (16.7)	60 (100%)
16	1.9 x10 <sup>4</sup>	0(0.00)	19 (100)	0(0.00)	0(0.00)	19 (100)
17	7.0 x10 <sup>4</sup>	60 (85.7)	0(0.00)	10 (1.43)	0(0.00)	70 (100%)
18	5.8 x10 <sup>4</sup>	40 (69.0)	18 (31)	0(0.00)	0(0.00)	58 (100%)
19	4.7 x10 <sup>4</sup>	17 (36.2)	30 (63.8)	0(0.00)	0(0.00)	47 (100%)
20	1.1 x10 <sup>4</sup>	0(0.00)	0(0.00)	11 (100)	0(0.00)	11 (100)
Control		1 (100%)	0(0.00)	0(0.00)	0(0.00)	1 (100%)
Total	93.7x10 <sup>4</sup> cfu/g	414 (45.4)	324 (35.5)	144 (15.8)	30 (3.3)	912 (100%)

*Valgains* occurs naturally in the intestine of humans and a wide variety of animals, also manure, soil and polluted water. The presence of staphylococcus may be explained by the fact that human beings, that is, processors or vendors, carry these organisms on several parts of their bodies which is known as a normal flora. This can be introduced into the freshly sliced water melon during handling processing or vending generally.

*Staphylococcus* spp is salt loving bacteria. This therefore illustrate the need for adequate evaluation of the physiochemical (including pH) characteristic of the water melon. *Bacillus* spp (aerobic spore formers) was also isolated in some of the cultured samples. Members of this bacteria group are normal inhabitants of soil and a food poisoning organism. The principal source of this organism is from unspecialized or poorly sterilized slicing and vending materials.

Based on the result of the whole water melon (control) that was properly washed with uncontaminated water and cut with a sterile knife it can be summarized that personal hygiene and processing practices of food vendors are major factors that determine safety in the consumption of sliced fruit which are consumed daily by many contain pathogenic agent as a result of poor personal hygiene on the apart of the vendor and this could cause health challenge when consumed.

### Conclusion

This study shows that some pathogens observed from the samples is as a result of handling, use of contaminated and poor vending materials.

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