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Microbial Quality of Some Leafy Vegetables Sold in Iree

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

This study investigates the microbial quality of some common leafy vegetables sold in Iree. Three common leafy vegetables were used which were *Amaranthus viridis* ('Tete'), *Corchorus olito rus* ('Ewedu') and *Talinum triangulare* ('Gbure'). The samples were bought from the Iree main market and packaged in a sterilized aluminium covered plates and were transferred immediately into the laboratory where they were examined for Total viable counts, coliform counts and Total fungal counts. The average total viable counts was 2.2 x 10^5cfu/mL for *Amaranthus viridis*, 2.3 x 10^5 cfu/mL for *Corchorus olitorius* and 1.9 x 10^5 for *Talinum triangulare*. Seven bacteria belonging to five genera and three fungal Spp. were isolated, which include, *Staphylococcus aureus, Bacillus subtilis*, *Bacillus cereus*, *Salmonella enteritidis*, *Enterobacter aerogenes*, *Eschericia coli*, *Micrococcus luteus*, *Aspergillus niger*, *Aspergillus flavus*, *Penicilium italicum* respectively. *Staphylococcus* (26%) was the most predominantly isolated followed by *Bacillus subtilis* (13%), *Eschericia coli* (12%), *Streptococcus* and *Micrococcus* (11%), Enterobacteriacea (9%), fungal (10%) and *Bacillus cereus* was the least (8%). These results showed that agricultural practices on these vegetables, like transportation, irrigation and even fertilizer application method could pose

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risks to the consumers, it is therefore advised that proper cooking of these leafy vegetables by boiling in 100°C boiling water, should strictly be adhered to before consumption not just mere blanching.

Keywords: Microbial quality; leafy vegetables; Amaranthus viridis; Corchorus olitorus; Talinum triangulare.

1. INTRODUCTION

Ireeis located within Nigeria in the state of Osun, in Boripe Local Government. Vegetables are plants (or plant's part) that are used as foods by man and animals. They can be roots, stems, leaves, flowers, fruits and seeds of plants. Examples include, cabbage, potato, turnip or bean. As it has been elucidated above, the word vegetable is a culinary term, the definition is arbitrary and subjective. However, [1] classified vegetable crops as follows: (a) leafy vegetables (b) Cole crop or crucifers, (c) Root and bulb crops, (d) legumes or pulses, (e) Solanaceous vegetables, and (f) cucurbits. Generally, vegetables can be grouped into two namely; consumable vegetative parts which are root, stem, and leafy vegetables and consumable reproductive parts; these include the flower, fruit and seed vegetables. The leafy vegetables are usually displayed in the open places during marketing, this also expose the produce to contamination, apart from contaminations during cultivation, harvesting, and transportation leading to increase in the microbial load before final consumption [2,3]. Not minding the contamination, vegetables are rich in essential nutrients like minerals, vitamins C, thiamin, riboflavin, B-6, niacin, folate, A. Fibre are usually supplied in large quantity by vegetables and Vitamin E is present in small quantity. Nutritional policies have strongly promoted the consumption of diet containing more than 400/g of fresh vegetables and fruits as nutritional goal for health promotion (FAO/ WHO 2004), meanwhile, if contaminants are not avoided, it can lead to food borne disease [4]. Although, different people had worked on different leafy vegetables, but the one sold in Iree, which is densely populated by students has not been studied. Students consume vegetable more than other soup sauce because it is very cheap. Hence, there is need to determine the microbial load and to for see the effect this can pose on the consumers. Therefore, the objective of this study is to determine the microbial loads on some commonly consumed leafy vegetables by the populace and the students.

2. MATERIALS AND METHODS

2.1 Collection of Samples

Each of the three leafy vegetables (*Amaranthus viridis* ('Tete'), *Corchorusolitorus* ('Ewedu') and *Talinum triangulare* ('Gbure') were bought from Iree on the market day from three different sellers in triplicates making nine samples. Each vegetable sampled was placed separately in sterilized aluminium plates and transported to the laboratory immediately.

2.2 Agar Used

The agar used were Nutrient agar, Potato dextrose agar, and Endo agar, for determining total plate count, fungal count and coliform count respectively. They were prepared according to manufacturer's instruction.

2.3 Microbiological Analysis

2.3.1 Microbial load determination

Each leafy vegetable sample was carefully dipped inside sterile water for 5 minutes by splashing inside the water to avoid the roots coming in contact with the sterile water. Each homogenate was serially diluted. At dilution of 10^5, 0.2 ml of the dilution was plated in duplicate on to different media plates. Plates were incubated for 24 h at 37°C. Potato Dextrose agar plates were, left at room temperature (28±2°C). Colonies were counted after the incubation time using Colony counter (Stuart Scientific, UK).

2.3.2 Purification of isolates

Purification of each of the different colonies was done by repeated sub-culturing using the respective agar plates, until, distinct discrete colonies on the different media were isolated and stored on agar slants at 4°C.

2.3.3 Coliform organisms

On Endo- agar coliform organisms and surrounding medium appear red while others microrganisms appear colourless.

2.4 Characterization and Identification of Isolates

2.4.1 Identification of fungal isolates

Identification was based on their morphological, macroscopic and microscopic characteristics as seen in culture plates [5].

2.4.2 Identification of bacterial isolates

Cultural characteristics and biochemical tests, IMVIC test, carbohydrate utilization, gelatin liquefaction, nitrate reduction, motility, oxidase and urease production were carried out according to [6].

3. RESULTS AND DISCUSSION

Average total viable count were presented in the figure below. The viable counts ranged from 1.3 to 2.2 x 10^5Cfu/ml for the three samples. However, *T. triangulare* had the least count on Nutrient agar plates as seen in Fig. 1.

3.1 Occurence of Each Isolate

Staphylococcus aureus had the highest occurrence (26%) among all the isolates followed by *Bacillus subtilis*. However, *Bacillus cereus* had the least followed by *Enterobacter aerogenes* (9%) as presented in Fig. 2.

3.2 Discussion

Eschericia coli is a foodborne disease causing organism, its presence in the leafy vegetable calls for serious alarm, as indicated by [7] who confirms that fresh and leafy vegetables also transmit microbial food borne diseases worldwide.

The presence of *E. coli* shows faecal contamination, which can be from the poultry fertilizer or sewage water used for irrigation [2]. This is in line with the work of [8], they found *E. coli* in 10.7% (9/84) of field samples of leafy vegetables. The kind of water used during

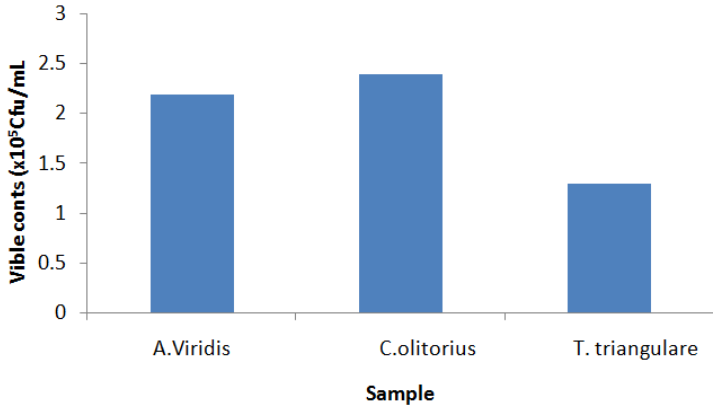

Fig. 1. Viable microbial counts associated with each vegetable sample

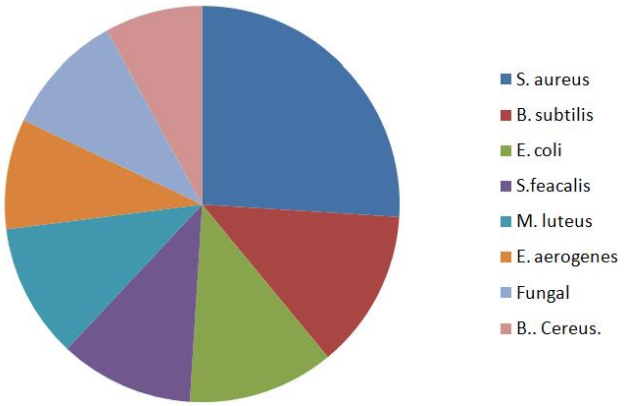

Fig. 2. Percentage occurrence of each isolate on the sampled vegetables

irrigation determines the type of microorganism associated with the leafy vegetables. This corroborates the work of [9] where they showed that using urine water for irrigation introduces intenstinal microorganisms on fresh leafy vegetables. A range of microbiological hazards can be contacted byconsumption of contaminated leafy vegetables [10]. Farm workers may also be sources or vehicles for contamination of produce in the growing field [11]. Foodborne outbreaks have been attributed to poor hygiene practices of food handlers [12] Machinery and equipment were also considered to have the potential to transfer microbial hazards from contaminated areas to growing fields.

4. CONCLUSION

Having discovered that agricultural practices on these vegetables, like transportation, irrigation and even fertilizer application method could pose risks to the consumers apart from the contaminants accommodated during marketing. it is therefore advised that proper cooking of these leafy vegetables by boiling in 100°C boiling water, should strictly be adhere to before consumption not just mere blanching as pointed out by [12] who worked on microbial quality of minimally processed ready-to-eat vegetables.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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