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Characterization and Isolation of Bacteria from Selected Fresh Fruits

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Authors' contributions

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

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ABSTRACT

Fresh fruit products eaten raw and minimally processed are important component of a daily diet. The study intends to isolate and characterized bacterial isolates cultured from selected fresh fruit samples in Esa-Oke Metropolis. Streak plate method was employed to isolate the bacteria. The result shows that two bacteria each were isolated from the fruit samples, except for banana on which only *Staphylococcus spp* was isolated. *Staphylococcus spp* was predominant bacterial isolate cultured from all the selected fresh fruit samples with 54.5% occurrence, *Escherichia coli* 18.2%, *Klebsiella spp* 18.2% and *Pseudomonas spp* 9.1%. The study concluded that the need for improved quality control in the storage of fresh fruit cannot be over emphasized as good hygiene should be encouraged by washing both the hand and the fruit before consumption.

Keywords: Fresh fruit; isolation; fruit samples; storage; post harvest technology.

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1. INTRODUCTION

Fresh fruit products eaten raw and minimally processed are important component of a daily diet. Fruit is the seed-bearing structure in flowering plants (also known as angiosperms) formed from the ovary after flowering [1]. Fruits are the means by which angiosperms disseminate seeds [1]. Fruits has always been a part of the human diet and is an important nutritional source, with high water content (70-85%) and a relatively high amount of carbohydrates but low contents of fat (less than o.5%) and protein (<3.5%). It usually contains many useful vitamins as well as minerals, dietary fiber and antioxidants [2]. Edible fruits have propagated with the movement of humans and animals in a symbiotic relationship as a means for seed dispersal and nutrition. In fact, humans and many animals have become dependent on fruits as a source of food [1]. The quality of fresh fruit includes many aspects such as appearance, colour, texture, flavor and nutritional value [3] out of which we have flavor as one of the most important quality traits for fresh fruits. Fruit flavour is made up of sugars, acids, salts, bitter compounds such as alkaloids, flavanoids and aroma volatiles [4,5]. More than 300 volatile compounds have been identified in apple fruit [4] and as it is, only few of the volatiles identified are very important. Usually, when a fruit grows towards its full maturity, many physiological changes in addition to its size and shape which are happening simultaneously. Typically, the first noticeable change is the desire of chlorophyll in the chloroplast of the skin cells so the ground colour of the fruit fades. A simultaneously attractive colour of the skin and flesh develops cells due to the accumulation of anthocyanins, carotenoids or flavones in vacuoles of epidermal cells [6]. Meanwhile, when a fruit passes its maximum ripeness, it begins to breakdown and decay. Rather than a simple breakdown process, senescence is the final phase in ontogeny of a fruit, in which a series of normally irreversible physiological and biochemical events are initiated, which leads to cell breakdown and death of the fruit [7].

However, raw vegetables (fruits) can harbour many microorganisms, which may be spread during washing, cutting, or peeling prior to the commercial distribution, and the microbial growth increase during storage [1]. Spoilage of fresh fruits and vegetables usually occur during storage and transport. Vegetables and fruits reach the consumer as fresh, dried, frozen, fermented, pasteurized, or canned. Contamination may take place during harvesting, handling, transportation or storage unless proper hygienic conditions were maintained. Mechanical damage may increase the susceptibility to decay and the growth of microorganisms may take place. Washing process in contaminated water may moisten surfaces enough to permit entry and growth of organisms. Storage in contaminated containers, use of contaminated dressing materials, possible contact with decayed products, unhygienic handling, fly infestation etc will also cause an accelerated rate of spoilage. Microorganisms are the causes of food spoilage and decay which reduce shelf life of fresh fruits and potentially maybe a source of food borne illness. It is estimated one-fourth of the harvested fruits and vegetables is spoiled before consumption. The deterioration of raw vegetables and fruits may result from physical factors, action of their enzymes, microbial action, or combinations of all these. Microbial spoilage in fruit and vegetable varies not only with the kind of fruit or vegetables but also to some extent with the variety. Hence, this study intends to isolate and characterized bacterial isolates cultured from selected fresh fruit samples in Esa-Oke Metropolis.

2. MATERIALS AND METHODS

2.1 Collections of Sample

Six (6) samples (orange, mango, banana, pawpaw, Pear, and cashew) were collected from six different locations in Esa-Oke metropolis, and thereafter transported to the Microbiology Laboratory in Department of Science Laboratory Technology, Osun State College of Technology, Esa-Oke, Osun State.

2.2 Culture Media

The culture media were prepared following the manufacture direction. The culture media used for isolation, stocking and for biochemical characterization of the bacteria isolates were eosin methylene blue agar (EMB), Nutrient agar, MacConkey agar, Blood agar, Mannitol salt agar (MSA).

2.3 Isolation of Bacteria

The streak plate method was used for isolation. The sterile swab sticks was used to swab the surface of fresh fruit samples and then inoculated on sterile prepared solidified agar.

2.4 Characterization and Identification of Bacterial Isolates

The characterization was done based on the colonial morphology, biochemical characteristic and cellular morphology. The colonial morphological was observed with an unaided eyes, the following morphological feature were used for the characterization; Colony shape, Elevation, Size, Edge. Gram staining and spore staining were carried out after which they were subjected to biochemical.

3. RESULTS

The result of bacteria isolates distribution data analysis shows in the Tables 1 - 2.

4. DISCUSSION

The result shows that *Staphylococcus spp, Klebsiella spp, E. coli* and *Pseudomonas spp* were the predominant bacteria genera cultured from the fresh fruit samples. Two (2) bacterial isolates were recovered from each of the fruit samples except the banana fruit that recorded only one (1) bacterium isolate. *Staphylococcus spp* was isolated from all the fruit samples with 54.5% occurrence, followed by *E. coli* and *Klebsiella spp* with 18.2% each, while *Pseudomonas spp* accounted for 9.1%.

Staphylococcus spp was the most predominant among the bacterial isolates cultured from fresh fruit samples. Generally, they are gram-positive aerobic organism which typically causes skin infection and sometimes Pneumoniae, endocarditis and Osteomyelitis in human. This means high consumption of these bacteria may increase morbidity and mortality rates among people due to their pathogenicity behavior which was observed on blood agar (Blood lysis). Staphylococci exist in air, dust, sewage, water, milk and food equipment as well as environmental surfaces, human and animals.

Table 1. Distribution of bacterial isolate among samples

Organisms	Orange	Pawpaw	Cashew	Banana	Pear	Mango
Staphylococcus spp.	1	1	1	1	1	1
Klebsiella spp.	-	1	1	-	-	-
E. coli	1	-	-	-	1	-
Pseudomonas spp.	-	-	-	-	-	1

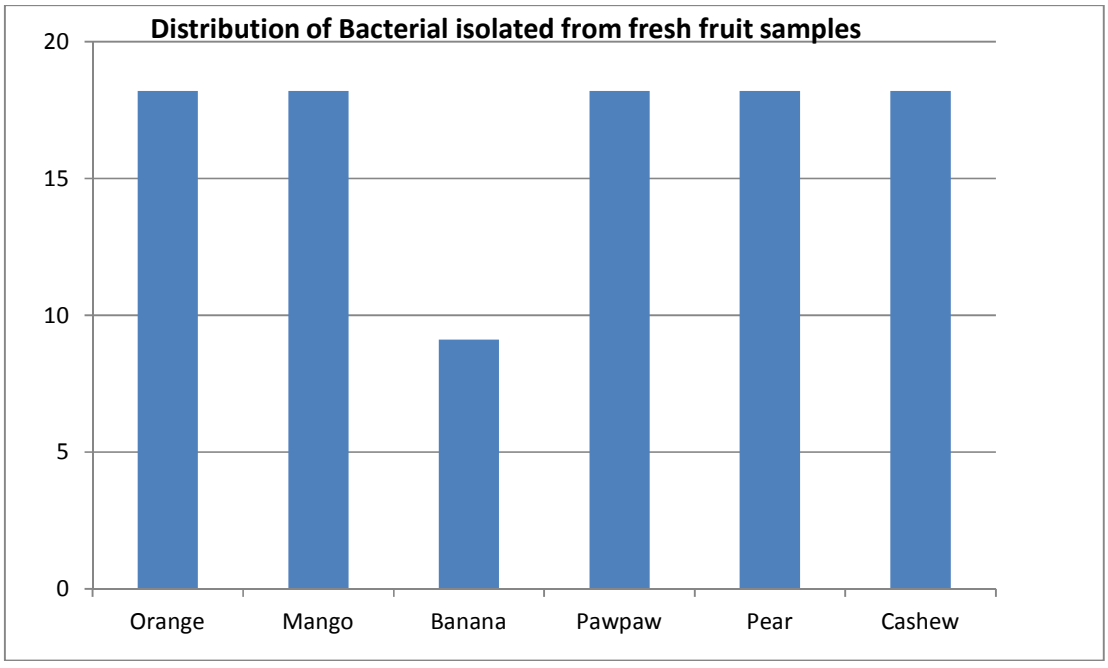

Fig. 1. Distribution of Bacterial isolated from fresh fruit samples

Table 2. Percentage distribution of bacterial isolate on fresh fruit samples

Sample	Number of Organisms	Percentage
Orange	2	18.182
Mango	2	18.182
Banana	1	9.091
Pawpaw	2	18.182
Pear	2	18.182
Cashew	2	18.182
Total	11	100

Escherichia coli are Gram-negative, facultative anaerobic, rod-shaped bacterium of the genus Escherichia that is commonly found in the lower intestine of warm blooded organisms (endoderm). Most *E. coli* strains are harmless but some stereotype may cause serious food poisoning in their hosts, and occasionally may responsible for product recalls due to food contamination. *E. coli* was one of the second predominant bacterial isolate cultured from fresh fruit samples. Also, *Klebsiella spp* was one the second predominant bacterial isolates cultured from fresh fruit samples; they are likewise Gram-negative, non-motile, encapsulated, lactose-fermenting, facultative anaerobic, rod-shaped bacterium. Although found in the normal flora of the mouth, skin and intestines, it can cause destructive changes to human and animal lungs if aspirated (inhaled), specifically to the alveoli (in the lungs) resulting in bloody sputum [8].

Pseudomonas spp was the least predominant bacterial isolates cultured from fresh fruit samples. It's a common gram-negative, rod-shaped bacterium that can cause disease in plants and animals, including humans. *Pseudomonas aeruginosa* is a prototypical "multidrug resistant (MDR) recognized for its ubiquity, it's intrinsically advanced antibiotic resistance mechanisms and its association with serious illnesses especially nosocomial infections such as ventilator-associated pneumonia and various sepsis syndromes.

5. CONCLUSION

This study has shown the analysis of bacteria associated with fresh fruit samples and the predominant organisms were *Staphylococcus spp*, *E. coli*, *Pseudomonas spp* and *Klebsiella spp*. However, the need for improved quality control in the storage of fresh fruit cannot be over emphasized. Therefore, good hygiene should be encouraged by washing both the hand and the fruit before consumption.

6. RECOMMENDATION

As some of the isolated bacteria are capable of producing toxins, it is recommended for strict monitoring and certification of fresh fruit, hoping to maintain pathogenic bacteria free fresh fruit and ultimately to ensure good health.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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