Microbiological examination of a packaged Fruit Juice from a Brand Sold in a Tertiary Institution in Offa, Kwara State, Nigeria

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Abstract- ***Fruit juices are widely consumed in many tropical nations and are known for their high nutritional value, mineral content, and vitamin content. This study's primary goal is to find and classify the microorganisms in a branded sachet of fruit juice that is marketed in a Nigerian university in Offa, Kwara state. The branded fruit juice in sachets was examined using the traditional pour-plate method. Isolates were identified morphologically, biochemically, and culturally. Total fungus count in the fruit juice was 3.7x10[4] sfu/ml, but total aerobic plate count was 6.1x10[6] cfu/ml. Staphylococcus aureus and Bacillus cereus were the bacteria isolated from the fruit juice sample, and Aspergillus niger and Fusarium species were the fungi. To reduce the risk of food-borne illnesses and infections, the government should inform people who prepare fruit juice of the importance of keeping good personal hygiene.***

Indexed Terms- ***Branded, Sachet Fruit Juice, Microbiological***

I. INTRODUCTION

Fruit juices and other ready-to-drink beverages have become a staple of contemporary eating habits. Packaged beverages' microbiological safety has drawn a lot of interest due to the convenience they provide (Smith *et al*., 2018). Consumers may be exposed to health concerns due to the presence of microorganisms in these products, which can come from a variety of sources including processing machinery, raw materials, and the environment (Chukwu and Ibe, 2017). The purpose of this study is to evaluate the microbiological quality of a branded sachet fruit juice that is frequently marketed on the grounds of a higher education facility (Smith *et al*., 2018).

A key factor in determining how safe a product is to consume is its microbiological quality (Oliveira *et al.*, 2017). Poor handling, storage, and processing practices can result in microbial contamination, which affects both product shelf life and customer health (Johnson *et al*., 2019). Fruit juices may contain a variety of bacteria, yeasts, and mould types as well as varying concentrations of these microorganisms. The importance of microbial enumeration and identification as markers of product quality and safety has been underlined by prior studies (Johnson *et al*., 2019).

Numerous studies that looked at the microbial makeup of different drinks found that they contained both pathogenic and spoilage germs (Bevilacqua *et al*., 2015). Ensuring microbiological safety is especially important in the setting of tertiary institutions, where a diverse population with varying susceptibilities is exposed to such products.

This study will use conventional microbiological techniques to evaluate the microbiological profile of the branded sachet fruit juice, such as total plate count, coliform enumeration, and yeast/mold identification. A thorough assessment of the product's microbiological safety will be produced by comparing these findings with recognised standards for microbial limits in beverages.

In order to guarantee customer safety and product quality, it is essential to understand the microbiological properties of branded sachet fruit juice offered in higher institutions. This study will add to our understanding of the microbial makeup of these drinks and shed light on potential areas for advancement in their manufacture, distribution, and handling.

II. METHODS

- SOURCE AND COLLECTION OF SAMPLES

A sample of branded sachet fruit juice was bought from vendors in Offa, Kwara-state, Nigeria. It was kept in a sterile sample cellophane and transferred immediately to the microbiology laboratory for microbial assessment.

- PREPARATION OF SAMPLES

In the laboratory, samples were shaken vigorously to ensure uniform distribution of microorganisms if present. The collected samples were diluted serially on arrival to the laboratory. The samples were mixed gently, and a quantity of 1ml was aspirated using a sterile pipette for the microbiological assay. For total viable bacterial count and coliform count, 1ml of dilutions 10^{-4} and 10^{-5} were transferred into sterile duplicate plates and 15 – 20ml of six different media were added and mixed immediately. For fungal count, 1ml of dilutions 10^{-4} and 10^{-5} were spread over duplicate plates of pre – prepared dried potato dextrose agar (PDA). Plates were incubated at 32^0C for 48hours for total bacterial count, at 37^0C for 24 hours for coliform count and at 25^0C for 5 days for fungi count.

- PREPARATION OF MEDIA

The media used were Nutrient agar and Potato dextrose agar. All the media used were prepared according to the manufacturers specifications and were autoclave at 121^0C for 15 minutes at 15 pascal.

III. MICROBIOLOGICAL ANALYSIS

- DETERMINATION OF MICROBIAL LOADS AND TYPES

Spread plate technique was used. Sterile petri-dishes (in duplicate) were labeled appropriately. Then 19 ml of molten nutrient agar, were poured aseptically on the sterile petri-dishes and the media were allowed to set on the bench. After the media were set, it was then exposed to the air for some minutes and incubated for 24 hours at 37^0c

- SUB -CULTURING

After 24 hours of incubation, the plates were observed and different colonies were picked separately and was streaked on a newly fresh prepared media and was incubated to get a pure culture.

- IDENTIFICATION OF BACTERIA ISOLATES

The isolates were observed for cultural and morphological characteristics such as shapes edges, elevation, pigment, consistency and optical characteristics. Various biochemical tests were carried out to authenticate the identity of the isolates.

- DETERMINATION OF FUNGAL ISOLATES

After sterilization it was allow to cool to 45^0C and was aseptically dispensed into the petri dishes, and it was allowed to set (solidify) and it was incubated for 3-5 days at room temperature (37^0C). it was being checked every day and after 5days it was brought out from the incubator and checked for result and observation.

- MICROSCOPIC EXAMINATION OF FUNGAL ISOLATES

Inoculating needle was used to pick a colony on the incubated plate of PDA and it was drop on a slide and lacto phenol cotton blue was drop on the slide and a cover slip was use to cover the slide and it was view under the microscope. The inoculating loop was sterilized by flamed on spirit lamp and was allowed to cool in a bit. It was then used to touched the sample and was streaked on the plate that containing potato dextrose agar (PDA) it was incubated for 3-5 days.

- IDENTIFICATION OF FUNGI ISOLATES

A drop of lacto -phenol cotton blue was dropped on a clean slide, small pieces of mycelium free of medium was removed with a sterile inoculating needle and was transferred to stain on the glass slide. It was then teased out with both needles and was covered with clean cover slip carefully avoiding tapping of air bubbles and was examined under X10 objectives lens and then high power objective lens.

IV. RESULTS

Table 1: Microbial count of the fruit juice sample (cfu/ml)

SAMPLE	TAPC	TCC	TFC
A	6.1×10^6	-	3.7×10^4

Key:
TAPC – Total aerobic plate count
TCC - Total coliform count
TFC - Total fungi count

Table 2: Morphological characteristics and biochemical tests of bacteria isolated from a branded fruit

Isolate	Gram Reaction	Cell shape	Cell arrangement	Motility	Catalase	Starch hydrolysis	Indole	Oxidase	Methyl	Coagulase	Probable organism
1	+ve	Circular	clusters	motile	+ve	+ve	-ve	+ve	-ve	+ve	*ococcus aureus*
2	+ve	rod	irregular	non-motile	+ve	-ve	-ve	+ve	+ve	+ve	*Bacillus cereus*

KEY: +ve means Positive

Table 3: Macroscopy and microscopy characteristics of fruit juice

Isolate	Macroscopy	Microscopy	Suspected fungi
1	Edges of colonies appear pale yellow Texture is cottony	It has smooth coloured condiophores and conida	*Aspergillus niger*
2	Brown-yellow colony with raised center and a flat white periphery followed by a yellow edge, then a white edge	Micro-conidaare ovoid in shape borne on phialided on branched conispores with septate hyphae	*Fusarium species*

DISCUSSION

The findings of this study shed light on the microbial composition of a branded sachet fruit juice sold within a tertiary institution setting. The presence of microorganisms in fruit juices is not uncommon and can arise from various sources, including raw materials, processing equipment, and handling practices. The obtained total aerobic plate count of 6.1x10^6 colony-forming units per milliliter (cfu/ml) indicates a significant microbial load in the examined fruit juice. Likewise, the total fungi count of 3.7x10^4 spores per milliliter (sfu/ml) suggests that fungal contaminants are also prevalent in the product.

The isolated microorganisms, namely *Staphylococcus aureus* and *Bacillus cereus* among bacteria, and *Aspergillus niger* and *Fusarium* spp among fungi, are known to encompass both spoilage and potentially pathogenic agents. *Staphylococcus aureus and Bacillus cereus* are well-documented in the literature as agents of foodborne illness due to their ability to produce heat-resistant toxins (Ndip and Njom, 2019). Similarly, *Aspergillus niger* and spp are recognized for their potential to produce mycotoxins, posing risks to consumer health.

Comparing the obtained microbial counts and species to previous studies is imperative to contextualize the findings. Previous research should be consulted to assess trends and changes in microbial loads over time and across different locations (Nwachukwu and Okorie, 2020; Obioha, and Babalola, 2019). It is essential to explore potential reasons for variations in microbial counts and types between this study and earlier investigations. Factors such as seasonal variations, handling practices, and processing conditions could contribute to these differences.

The presence of potentially pathogenic microorganisms in the examined fruit juice highlights

the importance of stringent hygiene practices throughout the production and distribution chain. The isolation of *Staphylococcus aureus* and *Bacillus cereus* emphasizes the significance of personnel hygiene and equipment sanitation to prevent cross-contamination during processing. Incorporating hygienic practices, along with regular equipment maintenance, can substantially reduce microbial loads in fruit juices.

The responsibility of ensuring the safety of food products lies with both producers and regulatory bodies. The government's role in educating individuals involved in fruit juice preparation is crucial to enhancing awareness about personal hygiene, proper handling, and the potential risks associated with microbial contamination. Robust regulations and adherence to food safety standards will contribute to minimizing the occurrence of foodborne diseases and infections among consumers.

CONCLUSION

In conclusion, the present study offers insights into the microbial composition of a branded sachet fruit juice sold in a tertiary institution. The high microbial counts and the presence of potentially pathogenic microorganisms underscore the need for improved hygiene practices and increased awareness among producers. Comparing these findings with previous research adds depth to the understanding of microbial contamination trends. By addressing these concerns through education and regulatory measures, the potential risks to consumer health can be mitigated, ensuring safer consumption of fruit juices.

RECOMMENDATIONS

The findings of this research provide valuable insights into the microbial quality of the branded sachet fruit juice sold within the studied tertiary institution. Building upon these findings, the following recommendations are put forth to address the observed microbial contamination and enhance the safety of the fruit juice:

- Enhanced Hygiene Practices
- Routine Monitoring and Quality Control
- Supplier Verification and Raw Material Screening
- Adherence to Regulatory Guidelines
- Education and Consumer Awareness

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