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Full Length Research Paper

Microbial assessment of some commercially prepared yoghurt retailed in Minna, Niger State

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Five samples each of twenty brands of commercially produced yoghurt were purchased randomly from different provision stores within Minna. The results showed that the total bacterial count ranged from 1.0×10^7 to 9.4×10^7 cfu/ml. The organisms isolated included species of *Staphylococcus, Lactobacillus, Enterobacter* and *Bacillus*, for bacteria, and species of *Aspergillus, Fusarium, Candida, Penicillium, Cephalosporium* and *Mucor* for fungi. However, species of *Bacillus* and *Aspergillus* were isolated the most frequently. The result revealed that yoghurt commercially produce in Minna are of high quality. All effort should be geared toward sustaining it.

Key words: Yoghurt, commercially, *bifidobacteria*, probiotic, lactobacili.

INTRODUCTION

Dairy foods provide an ideal food system for the delivery of beneficial bacteria to the human gut. Given the suitable environment that milk (and certain dairy products, including yogurt and cheese) provided, it promotes growth and support viability of these cultures. Dairy products such as yogurt contain “probiotic” cultures, e.g. *Lactobacilli* and which are currently among the best known examples of “functional food”. Their associated health claims range from alleviation of symptoms of lactose intolerance, treatment of diarrhoea, cancer suppression and reduction of blood cholesterol (McDonagh et al., 1997).

Yogurt is a cultured dairy product produced by lactic acid fermentation of milk and is also a means of preserving the nutrients in milk (Hui, 1992; Chandan 1989). It is generally known as cultured milk, as it is derived from the action of bacterial on all or part of the lactose to produce lactic acid, carbon dioxide, acetic acid, diacetyl, acetaldehyde and several other components that gives the product its characteristic fresh taste (Tamine and Robinson, 2004). It is produced by the lactic fermentation of milk using a combination of bacteria such *Lactobacillus bulgaricus* and *Streptococcus thermophilus* (Hui, 1992) and is consumed both as a food and as a thirst quenching beverage (Alfa-Lawal, 1984). Yogurt has also been described as a notoriously balanced food containing almost the nutrients present in milk but in a more assimilable form and they can be produced from skimmed or whole milk and there is a large range of flavors available commercially (Anthar, 1986).

Fermented milks, like the fresh milk from which they are produced, are liable to contamination. Moulds and yeast are the primary contaminants in yogurt produced commercially in Nigeria (Suriayarachichi and Fleet, 1981). Moulds and yeasts growing in yogurt utilize some of the acid and produce a corresponding decrease in the acidity, which may favor the growth of putrefactive bacteria (McGraw, 1987). The objectives of this study were to determine the microbial load of yogurt, and to characterize and identify pathogenic microbes.

MATERIALS AND METHODS

Sample collection

Twenty different brands of Nigerian-manufactured yoghurt were randomly purchased from different provision stores in Minna metropolis (Table 1). Their NAFDAC no. expiry date, manufacture date and batch number were recorded. All samples purchased were properly labeled and stored in a deep freezer in the Microbiology Laboratory of the Federal University of Technology.

Total bacterial and total coliform counts

The pour plate method was used. Ten ml of each sample was aseptically poured into sterile bottles and diluted serially in distilled water up to a 10^{-8} dilution. One ml of each the 10^{-7} and 10^{-8} dilutions were mixed with nutrient agar in Pertri dishes for determination of

Table 1. Total viable count of bacterial in samples of yoghurt analyzed.

Name of sample	Mean viable count (cfu/ml) x 10^7
Zeta	3.0
Maizube	5.2
Morning	9.4
A.A	8.05
Yoko	4.05
Bilway	7.5
Nabeel	7.5
Nice	3.0
San	4.0
To friends	1.0
Farm pride	No Growth
Divine	4.0
New life	45
Sahawa	3.0
Gama	3.75
Gyms	5.1
Home fresh	5.1
Oxford	2.1
Jerry	2.0
Habigo	3.0

cfu/ml ---- Colony forming unit per milliter.
NG ---- No growth

Table 2. Total coliform count in samples of yoghurt analyzed.

Name of sample	Mean of total count (cfu/m) x 10^7
Zeta	No growth
Maizube	No growth
Morning	1.0
A.A	3.0
Yoko	No growth
Bilway	No growth
Nabeel	No growth
Nice	No growth
San	No growth
To friends	No growth
Farm pride	No growth
Divine	No growth
New life	2.0
Sahawa	No growth
Gama	No growth
Gyms	No growth
Home fresh	No growth
Oxford	No growth
Jerry	No growth
Habigo	No growth

cfu/ml --- Colony forming unit per milliliter

the total bacterial count. For total coliform counts, 1 ml of the serial

Table 3. Total fungi count in samples of yoghurt analyzed.

Name of sample	Mean of total count (cfu/ml) x 10^7
Zeta	4.35
Maizube	3.6
Morning	4.85
A.A	1.65
Yoko	1.2
Bilway	2.1
Nabeel	2.85
Nice	3.8
San	3.1
To friends	2.0
Farm pride	2.0
Divine	1.2
New life	2.1
Sahawa	3.5
Gama	1.55
Gyms	2.2
Home fresh	5.5
Oxford	5.6
Jerry	1.6
Habigo	2.2

cfu/ml --Colony forming unit per milliliter.

dilutions was mixed with MacConkey medium. The agar plates were allowed to solidity and incubated at 37^{o}C for 24 h. The colo-nies that grew were counted and the values are expressed as colo-ny forming units (cfu)/ml. pure cultures of isolates were obtained by repeated subculturing onto fresh media and the cultures were maintained on agar slants for further identification.

Total fungal count

For enumeration of the total fungal count, 1 ml of the serial dilutions was mixed with Sabouraud dextrose agar (SDA). The medium was allowed to solidify and then incubated 37^{o}C for 24 – 48 h.

Characterization and identification of isolates

Bacterial isolates were characterized based on microscopic appea-rance, colonial morphology and biochemical tests. The isolates were identified by comparing their characteristics with those of known taxa, as described by Cheesbrough (2003), Oyeleke and Manga (2008).

RESULT AND DISCUSSION

Tables 1 to 4 shows the microbial counts of the twenty yoghurt samples analyzed. The results show that the products harbour various molds, yeast and bacteria, which include: *Aspergillus niger, Aspergillus fumigatus*, *Mucor* spp., *Fusarium* spp., *Penicillium notatum, Cephalosparium* spp., *Candida abdicants, Staphylococcus aureus, Enterobacter* spp., *Bacillus subtilis, B. cereus, Lactobacillus* spp. and *Streptococcus pyogenes*. For fun-

Table 4. Summary of bacteria and fungi isolates from samples of yoghurt analyzed.

Name of sample	Bacteria	Fungi
Zeta	*Bacillus cereus*	*Aspergillus fumigatus*
Maizube	*Staphylococcus aureus*	*Aspergillus niger*
Morning Fresh	*Bacillus subtilis, Enterobacter* spp, *Staphylococcus aureus*	*Aspergillus flavus*
A.A	*Bacillus subtilis, Enterobacter* spp.	*Mucor* spp.
Yoko	*Bacillus subtilis*	*Aspergillus niger*
Bilway	*Bacullus subtilis*	*Mucor* spp.
Nabeel	*Bacillus subtilis*	*Penicillium notatum, Aspergillus niger*
Nice	*Lactobacillus* spp., *Streptococcus pyogenes*	*Aspergillus niger, Aspergillus fumigatus, Penicillum notatum, Candida albicans*
San	*Bacillus cereus*	*Aspergillus niger, Cephalosporium* spp., *Mucor* spp.
To friends	*Bacillus cereus*	*Aspergillus niger*
Farm Pride	No growth	*Aspergillus niger*
Devine	*Lactobacillus*	*Aspergillus niger*
New life	No growth	*Aspergillus niger*
Sahawa	*Bacillus cereus*	*Aspergillus niger*
Gama	*Bacillus cereus*	*Aspergillus niger Aspergillus fumigatus*
Gyms	*Bacillus subtilis*	*Aspergillus fumigatus*
Home Fresh	*Bacillus subtilis*	*Penicillium notatum, Mucor* spp.
Oxford	*Bacillus subtilis*	*Cephalosporium* spp., *Aspergillus fumigatus*
Jerry	*Lactobacillus* spp.	*Aspergillus niger*
Habigo	*Bacillus subtilis*	*Aspergillus niger*

gi, species of *Aspergillus* had the highest frequency of occurrence (61%), followed by *Mucor* spp. (13%), while the lowest frequency of occurrence (3.2%) was recorded for *Fusarium* spp.. For bacteria, *Bacillus* spp. had the highest frequency of occurrence (70%), which was followed by *Enterobacter* spp. and *Lactobacillus* spp. (15%). The lowest frequency of occurrence (5%) was recorded for S*. pyogenes*. The total viable counts for bacterial isolates ranged between 1.0×10^7 to 9.4×10^7 cfu/ml and for fungal isolates between 1.2×10^7 to 5.6×10^7 cfu/ml.

The study revealed that the yoghurt samples analyzed harbours diverse species of bacteria. *Bacillus* spp. was observed as a major contaminant in the samples analyzed. This could probably be because of easy distribution of their spores in the environment. The spores can withstand harsh environmental conditions, which could be responsible for their proliferation and contamination of milk products, as reported by Umoh (1989). Umoh (1989) reported that improper handling, processing and packaging could lead to a high rate of *Bacillus* spp. in the sample, which is in agreement with our findings. *B. cereus* and *B. subtilis* are agents of food poisoning, as reported by Antai and Kuenberg (1985). The presence of *S. aureus* in the product could also be as a result of processing, handling and packaging since they are often found on the outer surface of the body, as reported by Prescott *et al*. (2004)

The presence of *S. pyogenes* and *Lactobacillus* spp. is desirable as the first is responsible for flavour and aroma, while the latter is involved in the fermentation of milk for yoghurt production, as reported by Trema and Musa (1998). The isolation of *Enterobacter* spp. may be as a result of poor environmental conditions due to dust and contamination of the water used as raw material, because *Enterobacter* spp. are also inhabitants of dairy products, as reported by Talaro and Talaro (2006) . *C. albicans* is a member of the normal flora of the skin and oral cavity; its presence in the samples may be due to the high sugar content of the yoghurt and is in agreement with Suriyarachchi and Fleet (1981). The predominant mold contaminant in the yoghurt samples analyzed was *Aspergillus* spp. *A. flavus* produces toxins, including aflatoxins which when consumed by man or animals mostly affects the liver, as reported by McDonagh et al. (1997). The presence of *Mucor* spp. in the yoghurt analyzed may be due to their rapid colonization and utilization of food substances and this might be responsible for their proliferation. *Mucor* spp. are involved in the decay of dairy products during storage, as reported by Frazier and Westhoff (1986). The result revealed that yoghurt comercially produce in Minna are of high quality, all effort should made to sustain the standard.

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