



## Microbiological and Sensory Evaluation of Commercial yoghurt in Zaria, Kaduna State

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### ABSTRACT

The microbial and sensory properties of 5 different commercial yoghurt, (coded as Z1, Z2, Z3, Z4 and Z5 yoghurt) in Zaria were analyzed. The microbiological analysis indicated the absence of Coliform bacteria. Z2 yoghurt had the highest bacterial load of  $1.77 \times 10^4$  cfu/ml while Z4 yoghurt recorded yeast and mould count of  $5.8 \times 10^2$  cfu/ml. From the result of the organoleptic analysis, there was a significance difference ( $p < 0.05$ ) in appearance between Z1 and Z2 yoghurt. There was also a significance difference ( $p < 0.05$ ) between Z2 and Z3 yoghurt in aroma. The taste of Z2 and Z4, Z5 and Z4 yoghurt differed significantly ( $p < 0.05$ ). However, there was no significance difference ( $p > 0.05$ ) between all the yoghurt samples in the texture and overall acceptability. Hence, it was concluded that yoghurt sold in Zaria are safe for consumption by both adult and children. It was recommended that proximate and functional analysis be carried out to determine the nutritional quality of the commercial yoghurts in Zaria.

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### INTRODUCTION

Dairy products constitute an important group of foods. They are known to contain energy and such nutrients as protein, fat, carbohydrate, and calcium. They also make an important contribution to vitamin intake (Fox and Cameron, 1989). Yoghurt is a valuable healthy food for both infants and elderly persons. For children, it is a balance source of protein, fats, carbohydrates, and minerals. For adults who usually have more sensitive colons or whose intestines have run out of lactase. Elderly intestines showed declining levels of bifidus bacteria, which allow the growth of toxin-producing and perhaps, cancer causing bacteria. Yoghurt also help to prevent osteoporosis, reduce the risk of high blood pressure. Yoghurt with active cultures helps the gut, prevents vagina infections and help one feel fuller (Magee, 2008).

Dairy products provide 23% of thiamine, 40% of riboflavin and 14% of nicotinic acid in an average diet. Although traditionally, dairy products have played an important role in the diet, their reputation has suffered recently on the accounts

of doubts expressed about the quantity and nature of fats in the diet. The animal fat and cholesterol in dairy products have both been linked with modern diseases of affluence which include; type 2 diabetes, asthma, coronary heart disease, cardiovascular disease, obesity, hypertension cancer and many others (Fox and Cameron, 1989).

In recent years, there has been increasing demand for a new range of dairy products, including yoghurts which are similar to traditional products but have a low fat content (Begona and Rosario 2000). Yoghurt is one of the most popular fermented dairy products widely consumed all over the world. It is obtained by lactic acid fermentation of milk by the action of a starter culture containing *Streptococcus thermophilus* and *Lactobacillus delbrueckii* sub-spp. *bulgaricus*. Yoghurt is more nutritious than many other fermented milk products because it contains a high level of milk solids in addition to nutrients developed during the fermentation process, and its sensory attributes have a large effect on consumer acceptability (Saint- Eve *et al*, 2008).

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Yoghurt whether produced from raw milk or fabricated milk, still have similar physical, chemical, sensory and microbiological properties. These properties are essential and must be preserved during storage. The chemical composition and microbiological quality of yoghurt has been reported by several workers (Saint-Eve *et al*, 2008, Yaygin and Kihc (1980), Dayisoylu (1993).

The flavour, texture and aroma of yoghurt vary depending on the country of origin as well as other factors including raw materials formulation and manufacture process. In some areas, yoghurt is produced in the form of a highly viscous liquid, whereas in other countries, it takes the form of a softer gel. Yoghurt is also produced in drinking form and can be frozen or blended with other ingredients to create, for example mousse type products, sorbet, yoghurt ice-cream, or other forms of dairy desert (Early, 1998). Increase in demand for yoghurt in Nigeria in recent times has led to proliferation of different kinds of yoghurt in the market, it is capable of being a source of illness/sickness for the large population of consumers in Zaria and environs. There is therefore a need to evaluate the microbial content of yoghurt sold in Zaria in order to determine its safety and perhaps safeguard the health and wellbeing of the numerous people consuming the product. The research therefore aimed at examining and analyzing different yoghurt products sold in Zaria metropolis based on sensory and microbial characteristics.

## MATERIALS AND METHODS

Five different types of yoghurt samples were purchased from local retail shops in Zaria town. The other materials were obtained from local grocery stores in Sabon-gari market, Zaria.

### Preparation of raw materials

The five yoghurt samples were for convenience and clarity coded as; Z1, Z2, Z3, Z4 and Z5 yoghurt, and stored at 4°C until used for analysis.

## Microbiological Analysis

Microbial analysis of the samples was carried out by the method of Ogbuile; *et. al* (2001) described by Ehirim and Onyeneke (2013). Each sample was serially diluted in sterile, distilled water to obtain the inoculums. Aliquot of each dilution was cultured on Nutrient Agar (NA) for bacteria and on Sabourad Dextrose Agar (SDA) for isolation of Fungi. Plates for fungi and bacteria were incubated at refrigerated temperature and room temperature for 7 days.

### Media preparation for total plate count

5g of plate count agar was added to 250ml of distilled water in a conical flask. It was heated to boiling and was then sterilized in an autoclave at 121°C for 15 minutes.

### Media preparation for yeast and mould count

14g of Sabourad dextrose agar was suspended in 25ml of distilled water in a conical flask and was mixed thoroughly. It was then sterilized by autoclaving for 15 minutes at 121°C.

### Sample preparation for serial dilution

20 test tubes were prepared, sterilized and were labeled approximately (10<sup>-1</sup>-10<sup>-4</sup>) according to the number of samples, and two were labeled as control for each sample. 9.0ml each of distilled water was dispensed into the test tubes and were sterilized and then allowed to cool. 1ml of the samples was pipette into the first test tube and was labeled 10<sup>-1</sup> and 1ml was transferred into the second test tube, from the second to the third until a dilution of 10<sup>-4</sup> was obtained.

## Sensory Evaluation

The samples were coded and presented to eighteen (18) panelists who were familiar with yoghurt. They tested the samples based on the following attributes: appearance, aroma, texture, taste and overall acceptability of the sample using a 9-point Hedonic scale, where 9 indicated extremely like and 1 extremely dislike. (Ihekoronye & Ngoddy, 1985).

## Statistical Analysis

**Table 1.** Result of Microbial Analysis of the Different Yoghurt Samples

Sample	Parameters (cfu/ml)		
	Total Plate Count	Total Coliform Count	Total Yeast & Mould Count
Z1	$1.63 \times 10^4$	Nil	$2.00 \times 10^2$
Z2	$1.77 \times 10^4$	Nil	$3.10 \times 10^2$
Z3	$1.68 \times 10^4$	Nil	$2.00 \times 10^2$
Z4	$1.68 \times 10^4$	Nil	$5.80 \times 10^2$
Z5	$1.73 \times 10^4$	Nil	$4.00 \times 10^2$

Source: Laboratory Analysis Result (2020)

The obtained data from the sensory analysis was subjected to Analysis of Variance T-test. The test of significance was done at 5% probability.

## RESULT AND DISCUSSION Of Findings

The result of the microbial analysis is presented in Table 1. From the result, the total bacterial count of the yoghurt samples ranged from  $1.63 \times 10^4$  cfu/g in Z1 yoghurt to  $1.77 \times 10^4$  cfu/g in Z2 yoghurt. The original bacteria in yoghurt are beneficial to human health, although the quantitative standard for yoghurt bacteria differs, it is generally accepted that yoghurt should contain  $10^7$  cfu of viable bacteria (*Streptococcus thermophilus* and *Lactobacillus bulgaricus*) per ml of yoghurt (Chougrani *et al*, 2009). Comparing the result in Table 1 to the regulatory standard, it can be discovered that, the bacteria load of the samples is within the acceptable limit.

The result of the coliform analysis indicates zero coliform in all the samples. This corresponds with the statement of Mac Graw (1997) who remarked that processed milk should contain no trace of coliform. However, Trainee and Robinson (1981) recommended that yoghurt should contain less than  $0.1 \times 10^6$  cfu/g. Hence, the

absence of coliform is a good indication of the good manufacturing practices employed by the producers and handlers. The samples analyzed, contained sizeable amount of yeast and mould count ranging from  $2.00 \times 10^2$  in Z1 yoghurt to  $5.80 \times 10^2$  in Z4 yoghurt. Tamime; *et al*, (1993) stated that any yoghurt sample containing  $10^6$  cfu/g yeast and mould count is unacceptable.

## Sensory properties of the yoghurt samples

The result of the sensory properties of the yoghurt samples analyzed is presented in Table 2. From the result, Z1 yoghurt was rated highest in appearance and was significantly different ( $p < 0.05$ ) from Z4 yoghurt. Z1 yoghurt was also rated highest in the aroma and was significantly different ( $p < 0.05$ ) from Z3 Yoghurt. The taste analysis ranked Z1 yoghurt above all other samples, and was significantly different ( $p < 0.05$ ) from Z4 yoghurt. Z3 Yoghurt was rated highest for texture, but was not significantly different ( $p > 0.05$ ) from other samples. Z5 yoghurt was the most generally accepted by the panelist, this was followed by Z1 yoghurt; Z4 yoghurt was the least accepted however there was no significant difference ( $p > 0.05$ ) between all the samples in general acceptability.

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**Table 2.** Result of the Sensory Analysis of the different Yoghurt Samples

Sample	Parameters				
	Appearance	Aroma	Texture	Taste	General Acceptability
Z1	7.78 <sup>a</sup>	8.22 <sup>a</sup>	6.67 <sup>a</sup>	7.56 <sup>a</sup>	7.67 <sup>a</sup>
Z2	7.22 <sup>ab</sup>	7.89 <sup>ab</sup>	6.89 <sup>a</sup>	7.00 <sup>ab</sup>	7.44 <sup>a</sup>
Z3	7.22 <sup>ab</sup>	7.11 <sup>b</sup>	7.56 <sup>a</sup>	6.56 <sup>ab</sup>	6.78 <sup>a</sup>
Z4	6.78 <sup>b</sup>	7.33 <sup>ab</sup>	6.78 <sup>a</sup>	6.00 <sup>b</sup>	6.67 <sup>a</sup>
Z5	7.56 <sup>au</sup>	8.00 <sup>au</sup>	7.44 <sup>a</sup>	7.33 <sup>a</sup>	7.78 <sup>a</sup>
LSD	0.91	0.95	1.47	1.15	1.22

Values are means  $\pm$  SD duplicate determinations

Values with different superscript within the same column are significantly different ( $p < 0.05$ )

Five Ice Cream samples= Z1, Z2, Z3, Z4 and Z5

LSD = Least Significant Difference.

## CONCLUSION

This study showed that the five types of yoghurt analyzed do not contain Coliforms that would have posed a health risk to consumers and the bacterial loads present falls within acceptable limit by regulatory authorities.

## RECOMMENDATION

Based on the findings it was recommended that further studies on proximate analysis and functional assays be carried out to determine the nutrients and functional attributes of commercial yoghurts sold in Zaria of Kaduna state.

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