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# Physicochemical, microbiological and sensory evaluation of yoghurt sold in Makurdi metropolis

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## ABSTRACT

The proximate composition, microbiological and sensory properties of 5 different commercial yoghurt, (coded as Y<sub>1</sub>, Y<sub>2</sub>, Y<sub>3</sub>, Y<sub>4</sub> and Y<sub>5</sub> yoghurt) sold in Makurdi metropolis were analyzed. The result of the proximate composition indicated that, the fat, Crude fibre, moisture and carbohydrate contents of the yoghurt samples differs significantly ( $p < 0.05$ ). However there was no significance difference ( $p > 0.05$ ) between the protein content of Y<sub>1</sub> yoghurt and Y<sub>5</sub> yoghurt, and also between the ash content of Y<sub>2</sub> yoghurt and Y<sub>4</sub> yoghurt. The result showed that, the total solids content, total solids non-fat content and viscosity of all the samples differed significantly ( $p < 0.05$ ). There was no significance difference ( $p > 0.05$ ) between the titratable acidity of Y<sub>1</sub>, Y<sub>3</sub> and Y<sub>5</sub> yoghurt, but result deferred from that of Y<sub>2</sub> and Y<sub>4</sub>. The microbiological analysis indicated that, Y<sub>2</sub> yoghurt had the highest bacterial load of  $1.77 \times 10^4$  cfu/ml while Y<sub>4</sub> 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 Y<sub>1</sub> yoghurt Y<sub>2</sub> yoghurt. There was also a significance difference ( $p < 0.05$ ) between Y<sub>2</sub> yoghurt and Y<sub>3</sub> yoghurt in aroma, the taste of Y<sub>2</sub> and Y<sub>4</sub> yoghurt, Y<sub>5</sub> and Y<sub>4</sub> 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.

**Keywords:** Yoghurt, quality evaluation, physicochemical properties.

## 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 senior citizens who usually have more sensitive colons or whose intestines have run out of lactase, yoghurt is also a valuable food. Elderly intestines showed declining levels of bifidus bacteria, which allow the growth of toxin-producing and perhaps, cancer causing bacteria. Yoghurt may help prevent osteoporosis, reduce the risk of high blood pressure. Yoghurt with active cultures helps the gut, may discourage vagina infections and may 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; type2 diabetes, asthma, coronary heart disease, cerebrovascular 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's obtained by lactic acid fermentation of milk by the action of a starter culture containing *Streptococcus thermophilus* and *Lactobacillus delbrueckii* sub- spp. *bulgaricus*. The role of these two genera in yoghurt manufacture can be

summarized as milk acidification and synthesis of aromatic compounds (Serra *et al*, 2009). It is generally accepted that the yoghurt should contain  $10^7$  cfu of viable bacteria (Fadela *et al* 2009).

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). 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), McGregor and White (1986)

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. Milk being a rich medium for growth of spoilage and pathogenic microorganisms, it is capable of being a source of illness/sickness for the large population of consumers in Makurdi and environs. There is therefore a need to evaluate the quality of yoghurt sold in Makurdi in order to determine its quality 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 Makurdi metropolis based on the physical, chemical, sensory and microbiological characteristics. This would provide information that can be used to enhance quality of the products and safeguard peoples' health and wellbeing.

## MATERIALS AND METHODS

### Source of materials

Five different types of yoghurt samples were purchased from local retail shops in Makurdi town. The other materials were obtained in the food processing laboratory of the University of Agriculture, Makurdi.

### Preparation of raw materials

The five yoghurt samples were coded as ;  $Y_1, Y_2, Y_3, Y_4$  and  $Y_5$  yoghurt. They were put in polyethylene bags and kept in a refrigerator at  $4^\circ\text{C}$  until used for analysis.

## Proximate composition Analysis

### Moisture content determination

The moisture content was determined by oven method as described by AOAC (2005). In this process, 2g of the sample was dried in a hot air oven for 24h at  $100^\circ\text{C}$ . The lost in weight was determined and recorded as the moisture content and expressed as;

$$\% \text{ moisture} = \frac{W_1 - W_2}{W_1} \times 100$$

Where;

$W_1$  = Initial weight of the sample

$W_2$  = Weight of the dried sample

### Ash Content Determination

The ash content was determined by the direct heating method as contain in AOAC (2005). In this method, 2g each of the samples was measured into a crucible of known weight, the sample was burnt to ash in a muffle furnace for 3h at  $550^\circ\text{C}$ . It was then cooled in a desiccator and the weight of the ash was finally determined. The % Ash content was calculated as;

$$\% \text{ Ash} = \frac{W_1 - W_2}{W_1} \times 100$$

Where;

$W_1$  = Initial weight of the sample

$W_2$  = Weight of the dried sample

### Protein Content Determination

The macro kjeldah method as described by AOAC (2005) was used to determine the crude protein content. 2g of the samples was introduced into the digestion flask. 10g of copper sulphate and sodium sulphate in the ratio of 5:1 and 25ml of concentrated sulphuric acid was added to the digestion flask. The flask was placed into digestion block in fume cupboard and heated until frothing ceased given a clear and light blue colouration. The mixture was allowed to cool and was diluted with distilled water until it reached 25ml of volumetric flask.

10ml of the mixture was poured into the distillation apparatus and 10ml of 40% sodium hydroxide was added. The released ammonia by boric acid was allow to continue until 10ml of boric acid is treated with 0.02m of hydrochloric acid until the green colour change to purple. The nitrogen in the sample was then determined. The percentage nitrogen of the sample was calculated as;

$$\% \text{ Nitrogen} = \frac{\text{molar mass of } N_2 \times \text{acid conc. (0.02m)} \times \text{volume made} \times \text{titre value} \times 100}{10 \times 1000 \times \text{sample weight (2g)}}$$

$$\% \text{ Crude protein} = \% \text{ Nitrogen} \times 6.25$$

### Fat content determination

The soxhlet solvent extraction method as described by AOAC (2005) was used to determine the fat content. In

this method 2g of the sample was weighed into a flat bottom flask of known weight with the extractor mounted on it. The thimble was held half way into the extractor and the weighed sample was carefully transferred into the thimble and the thimble was plugged with cotton wool. The extraction was carried out at the temperature of 40 – 60°C for 8hours. The solvent was removed by evaporation and then, the remaining part of the flask was dried in the oven at 80°C for 30minutes and was finally cooled in a desiccator. The flask was reweighed and the percentage fat was calculated as;

$$\% \text{ Fat} = \frac{\text{Weight of extracted fat}}{\text{Weight of sample used}} \times 100$$

### Crude fibre determination

The crude fibre was determined using the procedure in AOAC (2005). It was determined as the fraction remaining after digestion with standard sulphuric acid and sodium hydroxide under careful controlled condition. In this method, 5g of the sample was weighed and fat was extracted with petroleum ether using soxhlet extractor. The fibre sample was weighed into 500ml prepared sulphuric acid solution. The mixture was boiled for 30minutes, refluxed 3 times by boiling water and was followed by the addition of 100ml prepared sodium hydroxide. The beaker was heated and the boiling was allowed to continue for another 30minutes. Finally, the fibre was extracted and was dried by moistening with small portion of acetone which was permitted to drain. The sample in the crucible was incinerated at 550°C for 3hours until all carbonaceous matter were burnt. The crucible containing the ash was cooled in the dessicator and weighed.

The percentage crude fibre was calculated as;

$$\% \text{ crude fibre} = \frac{W_1 - W_2}{W} \times 100$$

Where:

W = weight of sample used

W<sub>1</sub> = Weight of sample and crucible before ashing

W<sub>2</sub> = Weight of crucible and ash

### Determination of carbohydrate content

The content of carbohydrate was determined by difference as described by Ihekoronye and Ngoddy (1985).

$$\text{CHO} = 100 - \%(\text{ ash} + \text{ protein} + \text{ fat} + \text{ crude fiber} + \text{ moisture})$$

### pH Determination

The pH was determined by the method described by Akpakpunam and Safa- Dedeh, (1995), where 10g of the

sample was dissolved in 100ml of distilled water. The mixture was allowed to equilibrate for 3minutes at room temperature. The pH was then determined by inserting the electrode of the pH meter in the sample then taking the result displayed on the pH meter.

### Determination of Total Titratable Acidity (TTA)

This was determined by the method described by AOAC (2005). The sample was dissolved in distilled water and mixed thoroughly. 1ml of phenolphthalein indicator was introduced into 10ml of the mixed solution. It was titrated against standard sodium hydroxide solution until pink colour persisted for about 10-15 seconds for complete neutralization.

### Determination of Total Solids

The Total Solids was determined as described by AOAC (2005). 3g of the sample was weighed into a dry Petri dish of a known weight. The total portion was pre-dried for 25minutes on steam bath and then dried for 3hours at 100°C in forced draft air oven. The Total Solid sample is the weight of the dried sample residue and was calculated as:

$$\% \text{ Total Solid} = \frac{W_2 - W_1}{W_1 - W} \times 100$$

Where:

W = Weight of the dish

W<sub>1</sub> = Weight of dish and sample test portion

W<sub>2</sub> = Weight of dish and dry sample

### Determination of Total Solids-Non-Fat

The total solids-not-fat was determined as described by AOAC (2005). It was obtained by taking the difference between % Total Solids and % Fat content.

That is:

$$\% \text{ Solids-Not-Fat} = \% \text{ Total Solids} - \% \text{ Fat content.}$$

### Viscosity

The viscosity of the samples was determined by the method of Kip *et al* (2006), as contained in Jeremia and Afam (2013). The spindle of the viscometer was inserted into the samples at the speed of 20rmp and the reading on the viscometer was taken after 3minutes for each sample.

### Microbiological Analysis

The microbial analysis of the samples was carried out by the method of Ogbulie, *et al* (2001) as described by

**Table 1.** Result of the Proximate composition of the different yoghurt samples

Samples	Parameters (%)					
	Protein	Fat	Crude Fibre	Ash	Moisture	CHO
Y <sub>1</sub>	5.26±0.01 <sup>b</sup>	3.25±0.01 <sup>a</sup>	0.21±0.01 <sup>e</sup>	1.02±0.01 <sup>a</sup>	78.62±0.02 <sup>e</sup>	11.69±0.01 <sup>b</sup>
Y <sub>2</sub>	4.38±0.01 <sup>c</sup>	1.91±0.01 <sup>c</sup>	0.36±0.01 <sup>d</sup>	0.61±0.01 <sup>c</sup>	81.41±0.01 <sup>c</sup>	11.38±0.01 <sup>c</sup>
Y <sub>3</sub>	4.02±0.01 <sup>d</sup>	2.11±0.01 <sup>b</sup>	0.44±0.01 <sup>c</sup>	0.72±0.01 <sup>b</sup>	80.31±0.01 <sup>d</sup>	12.85±0.01 <sup>a</sup>
Y <sub>4</sub>	6.14±0.01 <sup>a</sup>	1.81±0.01 <sup>d</sup>	0.51±0.01 <sup>a</sup>	0.61±0.01 <sup>c</sup>	81.63±0.04 <sup>b</sup>	9.38±0.01 <sup>e</sup>
Y <sub>5</sub>	5.24±0.01 <sup>b</sup>	1.32±0.02 <sup>e</sup>	0.46±0.01 <sup>b</sup>	0.41±0.01 <sup>d</sup>	82.41±0.01 <sup>a</sup>	10.28±0.01 <sup>d</sup>
LSD	0.03	0.03	0.02	0.02	0.06	0.09

Values are means ± SD duplicate determinations

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 7days.

#### 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 15minutes at 121°C

#### Sample preparation for serial dilution

20 test tubes were prepared, sterilized and were labeled approximately ( $10^{-1}$ - $10^{-4}$ ) 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  $10^{-1}$  and 1ml was transferred into the second test tube, from the second to the third until a dilution of  $10^{-4}$  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 indicates extremely like and 1 extremely dislike. (Ihekoronye and Ngoddy, 1985)

#### Statistical Analysis

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

#### Proximate composition of the Yoghurt samples

The result of the proximate composition of the different yoghurt samples is shown in Table 1. From the result the protein content of the sample ranged from 4.02% in Y<sub>3</sub> Yoghurt to 6.14% in Y<sub>4</sub> yoghurt. From the result, there was significant difference ( $p<0.05$ ) in the protein content of Y<sub>2</sub>, Y<sub>3</sub> and Y<sub>4</sub> yoghurt, while Y<sub>1</sub> and Y<sub>5</sub> yoghurt did not vary significantly ( $p>0.05$ ) in their protein content. The protein content of the yoghurt samples is relatively high as compared to the 3.5% protein content of yoghurt reported by Early, (1998).

The Fat content of the samples ranged from 1.32% in Y<sub>5</sub> yoghurt to 3.25% in Y<sub>1</sub> yoghurt. There was significant difference ( $p<0.05$ ) in the Fat content of all the samples. This indicated that Y<sub>1</sub> yoghurt had the highest percentage of Fat. Fat play an important role in improving the consistency of yoghurt and also provide twice as much energy as same quantity of carbohydrate and protein (Ehirim and Onyeneke, 2013).

The crude fibre of the samples ranged from 0.21% in Y<sub>1</sub> yoghurt to 0.51% in Y<sub>4</sub> yoghurt The crude fibre content of all the samples differed significantly ( $p<0.05$ ) from one another. According to Schneeman (2002) the crude fibre contributes to the health of the gastrointestinal system and metabolic system in man.

The ash content of the samples ranged from 0.41% in Y<sub>5</sub> yoghurt to 1.02% in Y<sub>1</sub> yoghurt The results showed significant difference ( $p<0.05$ ) between all the samples in their ash content. The ash value is an index of mineral content, which is needed for bone development, teeth formation and body functions (Trachoo and Mistry, 1998). This therefore indicates that Y<sub>1</sub> yoghurt is the better source of minerals among the samples.

The moisture content of the yoghurt ranged from 78.62% in Y<sub>1</sub> yoghurt to 82.41% in Y<sub>5</sub> yoghurt, all the samples are significantly different ( $p<0.05$ ) in the

**Table 2.** Result of the Chemical Analysis of the different yoghurt samples

Samples	Parameters				
	Total Solids (%)	Total Solids Not-Fat (%)	Titratable acidity (g/100ml)	Viscosity (Nsm <sup>-2</sup> )	pH
Y <sub>1</sub>	21.41±0.01 <sup>a</sup>	18.16±0.01 <sup>b</sup>	0.91±0.01 <sup>b</sup>	6.51±0.01 <sup>e</sup>	4.94±0.01 <sup>b</sup>
Y <sub>2</sub>	18.61±0.01 <sup>d</sup>	16.70±0.01 <sup>d</sup>	0.93±0.01 <sup>a</sup>	34.05±0.01 <sup>c</sup>	4.93±0.01 <sup>b</sup>
Y <sub>3</sub>	19.69±0.01 <sup>b</sup>	17.61±0.01 <sup>c</sup>	0.90±0.01 <sup>b</sup>	37.51±0.01 <sup>b</sup>	4.53±0.01 <sup>d</sup>
Y <sub>4</sub>	18.41±0.01 <sup>e</sup>	16.60±0.01 <sup>e</sup>	0.93±0.01 <sup>a</sup>	31.26±0.01 <sup>d</sup>	5.11±0.01 <sup>a</sup>
Y <sub>5</sub>	19.60±0.01 <sup>c</sup>	18.31±0.01 <sup>a</sup>	0.90±0.01 <sup>b</sup>	99.51±0.01 <sup>a</sup>	4.73±0.01 <sup>c</sup>
LSD	0.02	0.02	0.02	0.08	0.03

Values are means ± SD duplicate determinations

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

Five Yoghurt samples= Y<sub>1</sub>, Y<sub>2</sub>, Y<sub>3</sub>, Y<sub>4</sub> and Y<sub>5</sub>

LSD = Least Significant Difference

moisture content. This value corresponded with the report by Ahmad, (1994) who stated that the maximum moisture content of yoghurt should be 84% , as much water in yoghurt makes it less viscous thereby affecting texture and mouth feel.

The carbohydrate content ranged from 9.38 in Y<sub>4</sub> to 12.85 in Y<sub>3</sub> Yoghurt. The low carbohydrate value is attributed to the process of fermentation which converts carbohydrate basically lactose to lactic acid. This makes yoghurt an ideal food for lactose intolerance individuals (Ehirim and Ndimantang, 2004). Values with different superscript within the same column are significantly different (p<0.05) Five Yoghurt samples= Y<sub>1</sub>, Y<sub>2</sub>, Y<sub>3</sub>, Y<sub>4</sub> and Y<sub>5</sub> LSD = Least Significant Difference ,CHO = Carbohydrate

### Chemical properties of the yoghurt samples

The result of the chemical and physical properties of the yoghurt samples is presented in Table 2. From the result the total solids of the sample ranged from 18.4% in Y<sub>4</sub> yoghurt to 21.41% in Y<sub>1</sub> yoghurt. There was a significant difference (p<0.05) between all the samples. This content is reasonably high as compared to the findings of Hofi *et al.*, (1994) who stated that yoghurt should have a total solids of between 15% and 16% and Muhammed *et al.*, (2005) who reported a higher total solid of 17.11%. However, Weaver, (1993) reported that low percentage of total solids in yoghurt can lead to malfunction of the starter culture. The Total solids Not-Fat of the different yoghurt samples ranged from 16.60% in Y<sub>4</sub> yoghurt to 18.31% in Cabs yoghurt. The result also shows a significant difference (p<0.05) in the Total solids-Not Fat content of all the yogurt samples. The standard for total solids not-fat in the USA is 8.25% and 8.50% in UK and Australia respectively. However, these minimum are being raised to approximately 12-15% in order to achieve the required texture and viscosity of the final product (Early, 1998).

The Total Titratable acidity of the samples ranged from 0.90g/100ml in Y<sub>3</sub> Yoghurt and Y<sub>5</sub> yoghurt to

0.93g/100ml in Y<sub>2</sub> and Y<sub>4</sub> yoghurt with 0.91g/100ml in Y<sub>1</sub> yoghurt. From the result, there is no significant difference (p>0.05) between Y<sub>2</sub> yoghurt and Y<sub>4</sub> yoghurt and between Y<sub>3</sub>, Y<sub>5</sub> and Y<sub>1</sub> yoghurt.

The viscosity of the samples as shown in Table 2 indicates that Y<sub>5</sub> yoghurt is more viscous than all the samples with the viscosity of 99.51Nsm<sup>-2</sup>. There exists a significant difference (p<0.05) in the viscosity of all the samples. The viscosity of yoghurt is usually enhanced by the addition of stabilizers and thickeners such as modified or natural starches, alginates, agar, carrageenan, edible gums, pectin and celluloses (Early, 1998).

The result of the pH of the different yoghurt samples as presented in Table 2 indicates that, there is no significant difference (p>0.05) in the acidic level of Y<sub>1</sub> yoghurt and Y<sub>2</sub> yoghurt. However Y<sub>3</sub> Yoghurt has the highest acidic value while Y<sub>4</sub> yoghurt has the least acidic value.

### Microbial analysis of the yoghurt samples

The result of the microbial analysis is presented in Table 3. From the result, the total bacterial count of the yoghurt samples ranged from 1.63x10<sup>4</sup>cfu/g in Y<sub>1</sub> yoghurt to 1.77x10<sup>4</sup>cfu/g in Y<sub>2</sub> yoghurt. The original bacterial in yoghurt are beneficial to human health, although the quantitative standard for yoghurt bacteria differs, it is generally accepted that yoghurt should contain 10<sup>7</sup>cfu of viable bacteria (*Streptococcus thermophilus* and *Lactobacillus bulgaricus*) per ml of yoghurt (Chougrani *et al.*, 2009). Comparing the result in Table 3 to this 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 (1977) who remarked that processed milk should contain no trace of coliform. However, Traine and Robinson (1981) recommended that yoghurt should contain less than 0.1x10<sup>4</sup>cfu/g. The absence of coliform is a good indication of the Good

**Table 3.** Result of microbial analysis of the different yoghurt samples

Sample	Parameter (Cfu/ml).		
	Total Plate count	Coliform Count	Yeast and Mould
Y <sub>1</sub>	1.63x10 <sup>4</sup>	Nil	2.00x10 <sup>2</sup>
Y <sub>2</sub>	1.77x10 <sup>4</sup>	Nil	3.10x10 <sup>2</sup>
Y <sub>3</sub>	1.68x10 <sup>4</sup>	Nil	2.00x10 <sup>2</sup>
Y <sub>4</sub>	1.68x10 <sup>4</sup>	Nil	5.80x10 <sup>2</sup>
Y <sub>5</sub>	1.73x10 <sup>4</sup>	Nil	4.00x10 <sup>2</sup>

Five Yoghurt samples= Y<sub>1</sub>, Y<sub>2</sub>, Y<sub>3</sub>, Y<sub>4</sub> and Y<sub>5</sub>

**Table 4.** Result of the Sensory Analysis of the different yoghurt samples

Sample	Parameters				
	Appearance	Aroma	Texture	Taste	General Acceptability
Y <sub>1</sub>	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>
Y <sub>2</sub>	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>
Y <sub>3</sub>	7.22 <sup>ab</sup> 6.78 <sup>b</sup>	7.11 <sup>b</sup>	7.56 <sup>a</sup>	6.56 <sup>ab</sup>	6.78 <sup>a</sup>
Y <sub>4</sub>	7.56 <sup>ab</sup>	7.33 <sup>ab</sup>	6.78 <sup>a</sup>	6.00 <sup>b</sup>	6.67 <sup>a</sup>
Y <sub>5</sub>		8.00 <sup>ab</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 ± SD duplicate determinations

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

Five Yoghurt samples= Y<sub>1</sub>, Y<sub>2</sub>, Y<sub>3</sub>, Y<sub>4</sub> and Y<sub>5</sub>

LSD = Least Significant Difference

Manufacturing Practices employed by the producers and handlers.

The samples analysed, contained sizeable amount of yeast and mould count ranging from 2.00x10<sup>2</sup> in Y<sub>1</sub> yoghurt to 5.80x10<sup>2</sup> in Y<sub>4</sub> yoghurt. Tamime *et al* (1993) stated that any yoghurt sample containing 100cfu/g yeast and mould count is unacceptable.

### Sensory properties of the yoghurt samples

The result of the sensory properties of the yoghurt samples analysed is presented in Table 4. From the result, Y<sub>1</sub> yoghurt was rated highest in appearance and was significantly different (p<0.05) from Y<sub>4</sub> yoghurt. Y<sub>1</sub> yoghurt was also rated highest in the aroma and was significantly different (p<0.05) from Y<sub>3</sub> Yoghurt. The taste

analysis ranked Y<sub>1</sub> yoghurt above all other samples, and was significantly different (p<0.05) from Y<sub>4</sub> yoghurt. Y<sub>3</sub> Yoghurt was rated highest for texture, but was not significantly different (p>0.05) from other samples. Y<sub>5</sub> yoghurt was the most generally accepted by the panelist, this was followed by Y<sub>1</sub> yoghurt; Y<sub>4</sub> yoghurt was the least accepted however there was no significant difference (p>0.05) between all the samples in general acceptability.

### CONCLUSION

This study showed that the five types of yoghurt that were analysed do not contain coliforms that would have posed a health risk to consumers. The yoghurt is rich in ash content, an indication of minerals and also contained other nutrients in adequate quantities. Yoghurt is an

excellent source of vitamins, calcium, phosphorus, potassium and protein so should be consumed by both children and adults.

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