# Determination of The Microbial Quality of Hawked Pasteurized Cow Milk and Packaged Yogurt Products Sold in The Commercial Area of Federal Polytechnic Damaturu

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**ABSTRACT**

Bacterial load of selected hawked pasteurized cow milk and packaged Yoghurt products sold at the commercial area of Federal Polytechnic Damaturu were determined. Three samples each of pasteurized cow milk and packaged Yoghurt were randomly purchased from the commercial area and were put into sterile plastic containers and transferred to the laboratory for analysis. The samples were analyzed using prepared Nutrient agar media. Colonies formed were counted using colony counter and Gram staining was conducted. The result revealed higher bacterial colony count in the cow milk samples. Sample 2A is having $72x10^4$Cfu/ml and the least colony count is obtained from sample 9 having $24x10^3$cfu/ml, respectively. Gram staining revealed majority of the samples are Gram negative. This indicates that must hawkers of pasteurized cow milk are ignorant of the importance of personal hygiene and sanitation. Therefore, it is recommended that the pasteurized cow milk hawkers be sensitize and educated on the importance of personal hygiene and sanitation.

**Key words:** *Agar, Hygiene, Colony, Sanitation, Media,*

## INTRODUCTION

Pasteurized Cow milk also called Nunu by Northern Nigerian tribes comprises high amount of Amino acid, Calcium, Phosphorus and Vitamin A, C, E and B complex (Nebedum and obiakor, 2007). It is a common milk food similar to yogurt and other fermented milk products that is traditionally produced and consumed particularly by the Hausa and Fulani tribes of Northern Nigeria (Eka and Ohana, 2012).

Yogurt is a common fermented dairy product which is very popular and generally consumed around the world. It is produced through the fermentation of milk by bacteria leading to production of lactic acid via the action of *Streptococcus thermophilus* and *Lactobacillus delbruckii Spp*. during culturing in the milk (Serra et Al., 2009). Oyekele et al., (2009) described Yogurt as a nutritious food containing all the necessary nutrients present in milk and has also been described as a especially balanced food which can be commercially produced with added flavours from both whole milk and skimmed milk.

De *et al*., (2014), reported that the common contaminants of yogurt in Nigeria are the yeast and mold especially those produced for commercial consumption. Although it is a very popular drink in all parts of Nigeria, it has very high tendency of microbial contamination because of it being a diary material.

The production of yogurt requires a specific bacterium as earlier stated, often refers to as yogurt cultures that are actively involved in the production of lactic acid from lactose which consequently gives it the texture and special test that is unique to it (Goff, 2010).

According to Pohjanheimo & Sandell, (2009); Costal et al., (2017), the special features of yogurt which make it favourably disposed to consumers includes convenience, packaging and flavour. Moreover, Settachaimongkon et al., (2014), also reported that the presence of lactic acid bacteria in yogurt makes it a good source of health promoting substance, because of the ability of these bacteria to compete with several opportunistic microorganism and deliver necessary metabolites (Erkaya & Sengul, 2012) that enhances the health status of the final consumer.

Therefore, this study is aimed at determining the microbial load of both hawked Pasteurized Cow milk and packaged yogurt products sold at the commercial area of Federal Polytechnic Damaturu campus.

## METHODOLOGY

### Sample Collection

Three Pasteurized Cow milk samples from different sellers were randomly purchased and put into a sterile plastic container like-wise, three (3) brands of yogurt drinks were also purchased from different provision stores at the commercial area of Federal Polytechnic Damaturu. Information on the products like expiry date, manufacturing date and Bach numbers were recorded. All samples purchased are properly labeled and were taken to the laboratory for analysis.

### Preparation of media

The culture media was prepared using laboratory grade Nutrient agar, in which 28gms of Agar Powder was suspended in 1000ml distilled water. The powder was dissolved completely, after which it was sterilized by autoclaving at 121$^{o}$c for 15 minutes. The media was then allowed to stand cheek free, before been poured in the petri dishes and allowed to solidify.

### Microbiological Analysis:

To each of the sample that was collected (i.e. Yogurt and Pasteurized Cow milk), a 40ml each was used for the enumeration of microorganism on both Yogurt and Pasteurized Cow milk. Each sample was diluted serially into 9ml of sterile normal saline solution and was

homogenized by shaking for one (1) minute followed by the further decimal dilution. The dilution factor $10^{-4}$ of each sample was taken after which 1ml of each sample was used to inoculate freshly prepared media using pour plate method. Media that was employed for the enumeration for this research work is Nutrient Agar. The media was prepared according to the manufacturer's instruction and sterilized by autoclaving at $121^{oC}$ for 15minutes (Cheesebrough, 2003).

**Microbial Count**

Total viable count (TVC) of the colonies was carried out by subjecting the incubated plates into a colony counter for the total colony count before microscopy.

**Gram Staining**

A clean grease free slide was used where a smear was made on a clean slide with loopful of the sample. It was then air dried and heat fixed. Crystal violet was added on the dried smear and kept for about 30 seconds to 1 minute. The slide was then rinsed with water then flooded with Gram's iodine for 1 minutes and rinsed with water again. The slide was then flooded with Safranin for 1 minutes and was rise with water. The prepared slide was air dried and observed with oil immersion objectives of the microscope

**Statistical Analysis.**

Replicate readings obtained from the quantification procedures were analyzed for significance using Analysis of Variance (ANOVA).

**RESULT**

The results obtained for all the experiments are presented in the tables below. Each parameter was considered separately and presented in individual tables. Table 1 shows the result obtained from bacteria colony count of Pasteurized Cow milk samples

**Table 1: Bacterial load count from Pasteurized Cow milk**

| s/n | Sample code | Bacteria colony count cfu/ml |
|---|---|---|
| 1 | A3 | 64×10^3 |
| 2 | A4 | 72×10^4 |
| 3 | B3 | 68×10^3 |
| 4 | B4 | 64×10^4 |
| 5 | C3 | 56×10^3 |
| 6 | C4 | 68×10^4 |

The result obtained from bacterial colony count of yoghurt only sold commercially in Federal Polytechnic Damaturu campus is presented in the table below

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**Table 2 showing the result obtained bacterial load count from yoghurt product**

| | | |
|---|---|---|
| 1 | D3 | 44×10^3 |
| 2 | D4 | 36×1O^4 |
| 3 | E3 | 24×10^3 |
| 4 | E4 | 32×10^4 |
| 5 | F3 | 48×10^3 |
| 6 | F4 | 32×10^4 |

Combined the table for the result obtained after the bacterial colony count of all the samples of Pasteurized Cow milk and yoghurt product.

**Table 3: Bacterial load count from both Pasteurized Cow milk and yoghurt products.**

| S/N | Sample code | Bacterial colony count **cfu/ml**. |
|---|---|---|
| 1 | A3 | 64×10^3 |
| 2 | A4 | 72×10^4 |
| 3 | B3 | 68×10^3 |
| 4 | B4 | 64×10^4 |
| 5 | C3 | 56×10^3 |
| 6 | C4 | 68×10^4 |
| 7 | D3 | 44×10^3 |
| 8 | D4 | 36×1O^4 |
| 9 | E3 | 24×10^3 |
| 10 | E4 | 32×10^4 |
| 11 | F3 | 48×10^3 |
| 12 | F4 | 32×10^4 |

The result for Gram staining technique performed from the prepared sample plates is presented below.

**Table 4: Showing the result of Gram staining**

| S/N | Sample code | Gram Reaction | |
|---|---|---|---|
| | | +ve | -ve |
| 1 | A3 | | √ |
| 2 | A4 | | √ |
| 3 | B3 | | √ |
| 4 | B4 | | √ |
| 5 | C3 | | √ |
| 6 | C4 | √ | |
| 7 | D3 | √ | |
| 8 | D4 | √ | |
| 9 | E3 | √ | |
| 10 | E4 | √ | |
| 11 | F3 | √ | |
| 12 | F4 | | √ |

**DISCUSSION**

Three samples each of Pasteurized Cow milk and Yoghurt were randomly obtained from the commercial area of Federal Polytechnic Damaturu. These were plated and incubated at 37 $^0$c for 48 hours and the colonies formed were counted using the laboratory colony counter. The result obtained indicated that all the Pasteurized Cow milk sample analyzed have very high bacterial load count (Table 1) with the highest value of bacterial colony count of

$72\times10^{\wedge4}$cf/ml in sample code A4 while the least count is obtained from sample 5 with sample code C3 with bacterial colony count of $56\times10^{\wedge3}$cf/ml.

Yoghurt product analysis showing its bacterial colony count is presented in Table 2. The result indicated that high bacterial colony count was recorded in sample 5 with sample code $F^3$ having $48\times10^{\wedge3}$cf/ml and the least is obtained from sample 3 with sample code $E^3$. This is an indication of very low bacterial count compared to the result obtained in Pasteurized Cow milk. This can be attributed to the environment where these products are produced and processed.

Gram staining technique result from the different prepared samples plates is presented in Table 4 and clearly indicated that the bacteria found in the Pasteurized Cow milk samples are mostly Gram negative in nature, while the majority of bacteria from the package yoghurt are mostly Gram positive. No further investigation was done in that aspect, thus the need for further study.

**Conclusion**

A significant difference was observed between the two different samples studied in terms of bacterial load. The Pasteurized Cow milk was observed to have very high microbial count in all the analysis conducted while the yoghurt samples have lower microbial count when compared to the pasteurized Cow milk product. This could be due to lack of standardized method of Pasteurized Cow milk preparation, environmental variables, producing animals, the water use for processing as well as other equipment used during processing which might have harbors numerous numbers of microorganism. Contamination of Pasteurized Cow milk may also arise as a result of exposure of the product during selling as micro-organism are also found to be freely floating in the air.

**Recommendations**

1. There should be standard method for the preparation of locally made Pasteurized Cow milk.
2. Clean water should be used in processing the Pasteurized Cow milk.
3. Clean equipment should be used in processing the product.
4. Pasteurized Cow milk product on sell should not be exposed or left uncovered.
5. Pasteurized Cow milk hawkers should be educated from time to time on the importance of personal hygiene and sanitation.

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