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Microbiological quality Assessment of Commercial Yoghurt Brands sold in Bamenda, Cameroon

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Abstract

Pathogenic organisms in dairy products like yoghurt have for several years been a matter of public health concern. An investigation on the microbiological quality of 12 commercial samples of yoghurt gotten from four different brands designated A, B, C and D respectively were analysed using the poor plate method to determine their respective microbial qualities. Samples were randomly obtained from different locations in Bamenda and data were analysed using ANOVA. Results of the microbial enumeration showed that all samples recorded $0.0x10^1$cfu/ml,E coli counts. The total viable bacteria counts (TVC) of the samples were $0.17x10^5$ cfu/ml, $5.5x10^5$ cfu/ml, $6.0x10^5$cfu/ml, $6.3x10^5$cfu/ml for A, B, C and D respectively. There was no significant variation ($p>0.05$) in TVC among B, C and D. Meanwhile A and B both recorded $0.0x10^5$cfu/ml coliforms and C and D recorded $1.1x10^2$cfu/ml and $2.3x10^2$cfu/ml respectively. There was a significant variation ($p<0.05$) in coliform counts between C and D. D recorded the highest yeast and mould counts$121.66x10^4$cfu/ml while A recorded the least $6.66x10^4$ cfu/ml. The results of this study showed that three (B, C and D) out of four yoghurt brands sold in Bamenda at the time of this research were hygienically poor and hence not fit for consumption. In order to prevent public health issues, it is necessary for the right government bodies to pay close attention as to how commercialised yoghurt products are prepared, processed, stored, and distributed.

Keywords: Yoghurt, microorganisms, microbiological quality

Introduction

Yoghurt is one of most popular dairy products widely consumed all over the world, produced by the lactic acid fermentation of milk through the activity of a starter culture including *Streptococcus thermophiles* and *Lactobacillus delbruckii spp. bulgaricus,* (De *et al*., 2014). It provides probiotics known to be a beneficial bacteria that can promote health (Yang & Yoon, 2022). They are a nutrition-dense food, which deliver high biological value proteins and essential fatty acids and provide a good source of calcium, phosphorus, potassium, vitamin A, vitamin B2, and vitamin B12 (Hadjimbei *et al*., 2022).

Consumers in Cameroon are becoming more concerned about the quality of Yoghurts they consume due to episodes of diarrhoea they often experience (Moh *et al*., (2017). The situation is even more worrisome in Bamenda, given the poor environmental and personal hygienic conditions; inadequate handling methods, poor storage infrastructure and frequent power outages favour microbial growth which affects the quality of these products. Moreover, the conditions under which yoghurts are sold in some parts of Bamenda are not conducive as vendors carry the products from manufacturers without making any provisions for the maintenance of appropriate storage temperatures. This results to contamination by microorganisms leading to food poisoning like diarrhoea which poses health risk to the public or consumers.

The microbiological quality assessment of yogurt is primarily concerned with ensuring that the product does not deteriorate microbiologically during its predicted shelf-life and safeguarding customers from exposure to any health risks (Dike-Ndudim *et al*., 2022).It is a major concern in the food industry because of the acute risk to health posed by bacteria, mould, and yeast (Milani, 2020). Generally, Coliform detection or enumerations are often used as parameters for evaluating the quality of yogurt in different countries (Moh *et al*., 2017). Their presence in yoghurt indicates faecal contamination (Martin *et al*., 2016). Meanwhile, the presence of enterococci is an indication of inadequate sanitary conditions during the production and processing of milk (Dike-Ndudim *et al*., 2022). The presence of *Escherichia coli* (*E. coli*) on the other hand, is a common cause of poor yoghurt microbial quality, often resulting from unhygienic milk handling (Ghali-Mohammed *et al*., 2023).According to Dike-Ndudim *et al*., (2022), the most common pollutants in yoghurt are yeasts and moulds which often even in their few numbers can continue to proliferate at refrigerated temperatures and cause infection.

According to Odeyemi, (2016), more than 2 million deaths occur every year in developing countries due to foodborne diseases. Microbial contamination can result to food poisoning outbreaks and unsatisfactory products such as toxins which poses serious public health threats to consumers. Hence the relevance of this study in assessing the microbial quality of yoghurt and making use of the information obtained to educate stakeholders on necessary precautions required to safeguard public health.

Materials and Methods

Collection of samples: Four yoghurt brands were randomly selected within a period of 2 weeks from different locations in Bamenda (Commercial Avenue, Ntarikon, Hospital roundabout and Mobile Nkwen). The selection was done irrespective of the dates of supply at the various sales points. Samples were collected in triplicates after 3, 7 and 12 days to constitute a sample size of 12 and were labelled A, B, C and D. After collection, the samples were put into a cooler packed with ice and transported directly to IRAD Bambui where the analysis was to be conducted. Each sample was analysed once and the mean of the three samples that constituted each brand was taken.

Microbiological Analysis

Preparation of Material: All material were sterilised before usage and processed as directed by the manufacturer. Glassware such as Petri dishes, test tubes, pipettes, flasks, and bottles were sterilized in a hot oven at 170°C for two hours, while distilled water was autoclaved for 15 minutes at 121°C(Moh *et al*., 2017). Microbial enumerations were done using a colony counter (Gallenkamp) and where expressed as colony forming units per millilitre.

Preparation of serial dilutions: Microbial analysis were done following the pour plate method (Sanders, 2012). This was done using the decimal serial dilution technique with 10^{-2}, 10^{-3} and 10^{-4} as the dilution factor for the isolation of bacteria and fungi. With this, discrete colonies were obtained on the plated medium into 9ml of sterile diluents. 1.0ml of each yoghurt sample was added and further dilution was made up to 10^{-2} and 10^{-4}.

Enumeration of Total Viable Bacteria(TVC): Nutrient agar was used to determine the total viable bacteria count (Felix da Silva *et al*., 2017). Plating was carried out (near a Bunsen burner so

as to reduce contamination) using 0.1 ml of 10^{-3} and 10^{-4} dilutions. The cultured plates were incubated aerobically at 37∘C for 24-48hrs. The colonies were evaluated and counted at the end of the incubation.

Enumeration of Total Coliform Counts (TC): MacConkey agar was used to determine the coliform count(Sanders, 2012). The cultured plates were incubated aerobically at 37∘C for 24-48hrs after pour plating using 0.1ml of 10^{-1} and 10^{-2} dilutions. The colonies were evaluated and counted at the end of the incubation.

Enumeration of Yeast and Moulds (YMC): Sabouraud Dextrose agar was used to determine yeast and mould counts(Sanders, 2012). The cultured plates were incubated at 28 ^{0}C for 5 days after pour plating using 0.1ml of 10^{-3} and 10^{-4} dilutions. The colonies were evaluated and counted at the end of the incubation.

Enumeration of *E.coli*: Eoison Methylene Blue Levine Agar (EMB) was used to determine *E.coli* counts using 0.1ml of 10^{-1} dilutions(Sanders, 2012). E coli were incubated at 37 ºC for 24hrs but were later incubated at 44 ºC for 24hrs since no growth was registered at 37 ºC.

Results and Discussion

Total Viable Bacteria Count (TVC): Table 1 shows the mean values of total viable bacterial counts of the yoghurt samples. TVC ranged from $0.17\pm2.88x10^5$cfu/ml to $6.3\pm11.54x10^5$cfu/ml. Samples A recorded the lowest TVC $0.17\pm2.88x10^5$cfu/ml while sample D recorded the highest TVC $6.3\pm11.54x10^5$cfu/ml. These results revealed no statistically significant difference (P>0.05) between samples B, C and D. However there exists a statistically significant difference (P<0.05) between the sample A and all other three. Higher TVC were obtained by Dike-Ndudim *et al*. (2022) in Oweri, Nigeria and Mohammad & El-Zubeir, (2011) in Sudan. The standard viable bacterial count in yoghurt is 10^6–10^7cfu/ml (Moh *et al*., 2017). Thus, the results of this study showed that all four brands had a TVC within the standard value range. According to Moh *et al*. (2017), in most foods, the total bacterial count is often an indication for the sanitary quality, safety, and utility of foods which could be major cause food intoxication.

Total Coliforms counts (TC): Table 1 shows mean values of total Coliform counts of the yoghurt samples. TC ranged from 0.0 ± 0.0 $x10^2$cfu/ml to $2.3\pm5.77x10^2$cfu/ml. Samples A and C recorded 0.0 ± 0.0 $x10^2$cfu/ml Coliforms while sample D had the highest number of coliforms $2.3\pm5.77x10^2$cfu/ml. These counts are relatively lower than the 2.5 x 10^3cfu/ml obtained by Makut *et al*. (2014) in Keffi Nigeria but however, higher than the recommended tolerable limits which is fewer than 10cfu/ml as reported by (Dike-Ndudim *et al*., 2022). The results equally revealed no significant variations (P>0.05) between samples A and C while samples B and D varied significantly (P<0.05). Isolation of coliforms from yoghurt suggests negligence of both the vendors, and the producers and indicates poor hygienic conditions (Martin *et al*., 2016). According to Moh *et al*.(2017), Coliform detection or enumerations are often used as parameters for evaluating the quality of yogurt in different countries. In addition, Coliforms have been related to bacterial pneumonia cases more severe than those produced by *Streptococcus pneumonia* and urinary tract infection.

Total Yeast and Mould count (YMC): Table 1 shows mean values of total yeast and mould counts of the yoghurt samples which ranged from $6.66x10^4$ cfu/ml to 121.66 $x10^4$ cfu/ml. Sample A recorded the least YMC (6.66 x 10^4cfu/ml) while sample D recorded the highest YMC (121.66 x 10^4cfu/ml). Yeast and mould count of samples varied significantly ($p \leq 0.05$) between samples B and C. The values obtained in this study were higher than the standard acceptable value of fungi in yoghurt which should be equal to or less than 50 cfu/ml (Li & Li, 1998). According to Moubasher *et al*. (2018), Yeasts are a major cause of spoilage of yogurt. Moreover, mould and yeast contamination causes degradation and alters the biochemical characteristics and flavour of the product, as well as its appearance, which is economically unwanted and frequently results in product downgrade (Moh *et al*., 2017).

***Escherichia coli* Counts**: Results of the study revealed that all samples recorded $0.0x10^1$cfu/ml (Table 1). Contrary results were obtained by Makut *et al*. (2014) in Nasarawa State, Nigeria, Dike-Ndudim *et al*. (2022) in Imo state, Nigeria and Yang & Yoon, (2022) in Seoul, Korea who were reported to have found various strains of *E.coli* in yoghurt. The presence of *Escherichia coli* in yoghurt, is a common cause of poor yoghurt microbial quality, often resulting from unhygienic milk handling (Ghali-Mohammed *et al*., 2023).

Table 1: Microbial characteristics of yoghurt brands sold in Bamenda

Yoghurt samples	Total Viable Bacteria Count (cfu/ml)x10^5	Total Coliform Count (cfu/ml)x10^2	Yeast and Mould count (cfu/ml)x10^4	*E. coli* (cfu/ml)x10^1
A	0.17 ± 2.88^b	0.0 ± 0.0^c	6.66 ± 2.88^c	0.0
B	5.5 ± 13.22^a	1.1 ± 2.88^b	48.33 ± 16.07^b	0.0
C	6.0 ± 27.83^a	0.0 ± 0.0^c	23.33 ± 12.58^c	0.0
D	6.3 ± 11.54^a	2.3 ± 5.77^a	121.66 ± 12.58^a	0.0

Values followed by the same superscript in a column are not significantly different from each other according to the tukey's comparative test at 95% confidence interval.

Conclusion

In conclusion, the findings of this investigation at the time of this research showed that three of the four brands of yoghurt marketed in Bamenda were contaminated with bacteria, yeast, and mould and hence not considered fit for consumption. These findings have public health implications, particularly for consumers of these yoghurt brands who may be exposed to food borne diseases like diarrhoea. In order to prevent public health issues which could arise as a result of the consumption of contaminated yoghurt, it is necessary for the right government bodies like ANOR to pay close attention as to how commercialised yoghurt products are prepared, processed, stored, and distributed

References

De, N., Goodluck, T. M., & Bobai, M. (2014). Microbiological quality assessment of bottled yogurt of different brands sold in Central Market, Kaduna Metropolis, Kaduna, Nigeria.

Dike-Ndudim, J. N., Nnadiobi, C., Ndubueze, C. W., & Chinecherem Ndudim, V. (2022). Assessment of the Microbiological Status of Yoghurt Sold in Owerri, Imo State, Nigeria. Asian Journal of Biology, 1–11. https://doi.org/10.9734/ajob/2022/v14i230206

Felix da Silva, D., Junior, N. N. T., Gomes, R. G., dos Santos Pozza, M. S., Britten, M., & Matumoto-Pintro, P. T. (2017). Physical, microbiological and rheological properties of probiotic yogurt supplemented with grape extract. Journal of Food Science and Technology, 54(6), 1608–1615. https://doi.org/10.1007/s13197-017-2592-x

Ghali-Mohammed, I., Odetokun, I. A., Raufu, I. A., Alhaji, N. B., & Adetunji, V. O. (2023). Prevalence of *Escherichia coli* O157 isolated from marketed raw cow milk in Kwara State, Nigeria. Scientific African, 19, e01469. https://doi.org/10.1016/j.sciaf.2022.e01469

Hadjimbei, E., Botsaris, G., & Chrysostomou, S. (2022). Beneficial Effects of Yoghurts and Probiotic Fermented Milks and Their Functional Food Potential. Foods, 11(17), 2691. https://doi.org/10.3390/foods11172691

Li, F., & Li, Y. (1998). [Study on the contamination level and the tolerable limit of mould and yeast in yoghurt]. Wei Sheng Yan Jiu = Journal of Hygiene Research, 27(4), 257–258.

Makut, M. D., Ogbonna, A., & Dalami, H. (2014). An Assessment of the Bacteriological Quality of Different Brands of Yoghurt Sold in Keffi, Nasarawa State, Nigeria. Journal of Natural Sciences Research, 4(4), 19.

Martin, N. H., Trmčić, A., Hsieh, T.-H., Boor, K. J., & Wiedmann, M. (2016). The Evolving Role of Coliforms As Indicators of Unhygienic Processing Conditions in Dairy Foods. Frontiers in Microbiology, 7. https://www.frontiersin.org/articles/10.3389/fmicb.2016.01549

Milani, E. (2020). Chapter 19—Assessment and monitoring of saffron microbiological criteria. In A. Koocheki & M. Khajeh-Hosseini (Eds.), Saffron (pp. 307–320). Woodhead Publishing. https://doi.org/10.1016/B978-0-12-818638-1.00019-8

Moh, L. G., Keilah, L. P., Etienne, P. T., & Jules-Roger, K. (2017). Seasonal Microbial Conditions of Locally Made Yoghurt (Shalom) Marketed in Some Regions of Cameroon. International Journal of Food Science, 2017, 1–16. https://doi.org/10.1155/2017/5839278

Mohammad, E. E. B., & El-Zubeir, I. E. M. (2011). Chemical Composition and Microbial Load of Set Yoghurt from Fresh and Recombined Milk Powder in Khartoum State, Sudan. International Journal of Dairy Science, 6(3), 172–180. https://doi.org/10.3923/ijds.2011.172.180

Moubasher, A.-A. H., Abdel-Sater, M. A., & Soliman, Z. S. M. (2018). Yeasts and filamentous fungi associated with some dairy products in Egypt. Journal de Mycologie Médicale, 28(1), 76–86. https://doi.org/10.1016/j.mycmed.2017.12.003

Odeyemi, O. A. (2016). Public health implications of microbial food safety and foodborne diseases in developing countries. Food & Nutrition Research, 60, 10.3402/fnr.v60.29819. https://doi.org/10.3402/fnr.v60.29819

Sanders, E. R. (2012). Aseptic Laboratory Techniques: Plating Methods. Journal of Visualized Experiments : JoVE, 63, 3064. https://doi.org/10.3791/3064

Yang, S. Y., & Yoon, K. S. (2022). Quantitative Microbial Risk Assessment of *Listeria monocytogenes* and Enterohemorrhagic *Escherichia coli* in Yogurt. Foods, 11(7), Article 7. https://doi.org/10.3390/foods11070971

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