APR -10

Bacteriological Examination of Locally Fermented Milk *(Nono)* Sold in Hadejia Metropolis, Jigawa State

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Abstract
The study was conducted to examine the bacterial quality of *Nono* sold atatHadejia Metropolis, Jigawa State. *Nono* Samples from four (4) locations namely Yan Maza, UjaJama'are, Tsohuwar Tasha and Yan Daru were purchased using simple random sampling technique. The *Nono* samples were packaged and labeled in sterile plastic tubes and immediately transported to Microbiology Laboratory for bacterial analysis using Methylene Blue Reduction Test (MBRT) and Total Coliform Count (TCC) Techniques. Results from the MBRT and TCC showed that *Nono* samples collected from all the treatments were graded fairand have less than 300 cfu/ml. It was concluded that *Nono* sold at the studyarea was safe for consumption due to its less bacterial load,hence it wasrecommendedfor consumption.

Keywords: Fermented milk, *nono,* bacteria load, coliform

Introduction

Milk is a complete food with significant amount of essential nutrients require by children and adults for growth, development and well-being (Haug and Hostmark, 2007). Milk is highly perishable and prone to microbial spoilage due to its high moisture and nutrients profiles (Schmidt*et al.,* 2009).Fermented milk products fulfill multiple purposes in rural developing communities (O'Mahony, 1988). They are consumed as food and beverages and the market value and storage life are improved over that of raw milk (Motarjemi and Nout, 1995). Platt (1964) stated that fermented milk is a good source of B vitamins. There are also claims that digestibility of the milk protein is improved by fermentation (Mashal, 1986). *Nono* is processed by collecting fresh cow milk and allowing it to ferment for a day or two. The Fulani ferment the milk in calabashes. *Nono* is yoghurt like in taste (a sharp acid taste) and can be consumed alone or with sugar and *fura*. The latter is made of millet dough mixed with spices, compressed in to ballsand cooked for about 30 minutes (Owusu-Kwarteng *et al*., 2010). The cooked *fura* is crumbled in a bowl of *Nono* into what is called *fura* da *Nono*. The production of fermented milk does not involve the use of starter cultures, suggesting that the fermentation arises spontaneously from microbes originating from the environment, processing equipment or processors (Akabanda *et al.,* 2010).

The objective of the study is to assess the bacterial quality of *Nono* offered for sale at Hadejia Metropolis, Jigawa State.

Materials and Methods

The research was conducted at Hadejia Local Government Area of Jigawa State, Nigeria. Hadejia is one of the oldest Local Government Areas created since 1975 from the then Kano State (now Jigawa State) of the Northern Nigeria. Hadejia emirate comprises of Hadejia, Mallam-Madori, Kafin-Hausa, Birniwa, Guri, Kiri-Kasamma, Kaugama and Auyo Local Government Areas. Hadejia town is the capital of Hadejia Emirate and is located at the central part of the emirate which lies between 10^{O} 02.28' 14"E longitude and 12^{O}27. 12' 49"N Latitude. The area has an annual rainfall ranging from 100cm to 110cm per annum. The temperature ranges between 31 to 40^{O}C. The area is characterized by two seasons in a year; it has about 6-8 months of dry season and the raining season last for about four months. *Nono* Samples from four(4) locations within Hadejia metropolis (Yan Maza, UjaJama'are, Tsohuwar Tasha and Yan Daru) were purchased using simple random sampling technique. The *Nono* samples were packaged and labeled in sterile plastic tubes and immediately transported to microbiology laboratory for bacterial analysis.

The samples were analysed using Methylene Blue Reduction Test (MBRT) and Total Coliform Count following the methods described by De Silva*et al.* (2016).The MBRT determines the ability of bacteria in milk to grow and consume the dissolved oxygen which reduces the oxidation-reduction potentials in the medium. Ten (10) ml of milk from each sample was transferred in to an appropriate labeled test tube, one (1) ml of redox indicator was added and the test tube tightened with mouth stopper. The test tubes were gently inverted for about four to five times to ensure proper mixing of the methylene blue solution, the tubes were kept in a water bath at 37 ^{o}C noting the incubation time, that is, the time elapsed for the color to turn whitish appearance.

Results were interpreted following the method described by Thornton and Hastings (1930) as: Reduction within 30 minutes: Very poor quality, 2. Reduction occurring between 30 minutes and 2 hours: Poor quality, 3. Reduction occurring

between 2 and 6 hours: Fair quality, 4. Reduction occurring between 6 and 8 hours: Good quality and 5. Not reduced in 8 hours: Excellent quality. Using Total Coliform Count. The milk was serially diluted with normal saline to 10^{-1}, 10^{-2}, 10^{-3} and10^{-4} and kept in sterile tubules labeled 1,2,3, and 4, respectively. 1 ml milk dilution from each tube was inoculated on to McConkey agar plates and allowed to incubateat 37^0C for 24 hours. Plates with visible bacterial growth were counted using colony counter following the method of ICMSF (1978).

Results andDiscussion

The result of the methylene blue reduction test was presented in table 1. The result showed that *Nono* samples collected from all the locations were graded fair because it took methylene blue indicator 2 to 6 hours to change to colourless, even though all the "*Nono*" samples were graded fair but "*Nono*" sold at Yan Maza and Tsohuwar Tasha were better in terms of bacterial load compared with "*Nono*" sold at UjaJama'are. Table 2 showed the total coliform count of "*Nono*" samples collected from the study area. Result showed that, the Total Coliform Count in all the samples were less than 300 cfu/ml, hence the samples were safe for consumption.

Table 1: Methylene blue reduction test results (Time set=11.05am)

Sample I.D	Decolourization time	Time	Grade/Remark
1	4:27 pm	5:24 hours	Fair
2	2:00 pm	2:55 hours	Fair
3	4:25 pm	5.20 hours	Fair
4	3:27 pm	4:22 hours	Fair

1= Yan Maza, 2= UjaJama'are 3= Tsohuwar Tasha 4= Yan Daru

Table 2: Result of total coliform count

Sample ID	No. of Colonies	Total Coliform Count (cfu/ml)		
		10^1	10^2	10^3
1	>300	52.5	17.5	17.5
2	>300	257.2	221.2	221.5
3	>300	225.5	112.5	112.5
4	>300	217.5	212.5	212.5

1= Yan Maza, 2 = UjaJama'are, 3= Tsohuwar Tasha and 4= Yan Daru

Milk basically contains all the nutrients necessary for microbial growth and metabolism, making it susceptible to microbial contamination. To ensure good microbial quality of milk and milk products, proper hygiene must be ascertained to ensure safety from infection after consumption of such products and to promote quality assurance. On the whole, the major sources of microbial contamination of milk appear to be handling by processors and the use of contaminated water and equipment (Bernard *et al*., 2015). So control of milk contamination can be achieved if aseptic techniques are employed during the production of milk (Nwakanma *et al*., 2015). The variation in the bacterial counts may be attributed to the samples used, the packaging materials used, contamination by flies, method of handling and transportation and the air flora of the environment (Onuorah *et al*., 2015**)**. Processing operations such as heating, boiling, filtration, freezing, irradiation of finished products, addition of condiment and condition of storage affect both bacterial and fungal loads (Igene, 1990). High microbial loads lead to spoilage of foods that have not been properly processed or stored(Campbell, 2003;Murano, 2005).

Conclusion

The study concluded that *Nono* sold at Hadejia Local Government Area was safe for consumption due to its less bacterial load.

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