

CHEMICAL AND MICROBIOLOGICAL PROPERTIES OF *NONO* (LOCALLY FERMENTED MILK) SOLD AT BAYERO UNIVERSITY, KANO

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ABSTRACT

Nono is an African fermented beverage commonly prepared by the Fulani cattle herdsman, sold by their maids and consumed particularly by the Hausa and Fulani tribes of Northern Nigeria. This study was carried out to assess the physiochemical and microbiological quality of *Nono* on sale at Bayero University, Kano, Nigeria. The chemical parameters (total solids (TS), Ash, moisture, solids-not-fat (SNF), fat, crude protein, and pH) were determined using Standard procedures. The microbiological analyses carried out were based on the enumeration of aerobic mesophilic bacteria, coliform count as well as detection of some pathogens using the methods of International Dairy Federation. The results obtained did not reveal significant differences among the three campuses of the university. However, Aminu Kano Teaching Hospital (AKTH) recorded highest TS (56.00%) followed by New campus (41.67%). The New campus had the highest CP (86.96%), followed by Old campus, AKTH recorded highest SNF (53.13%) followed by New campus (38.70%), Old campus recorded highest Fat content (3.43%) followed by AKTH (2.83%), old campus recorded highest pH (6.97) followed by New Campus (6.27) and AKTH recorded highest Ash content (0.47%) followed by New campus (0.29%). The results of microbiological quality assessment did not reveal the presence of coliforms as well as the pathogens considered. From the findings of this study, it is concluded that *Nono* put on sale in the study area was not safe for public consumption and can be a source of milk-borne infections since some of the chemical and microbiological qualities evaluated were not within the recommended and acceptable standards. Further research should be carried out to confirm if the *Nono* sold at the campuses are truly from milk source or non-milk substances.

Keywords: Physiochemical analysis, Microbiological analysis, *Nono*, dairy products

INTRODUCTION

Nono is an African milk food similar to yoghurt and other fermented milk products that is traditionally produced and consumed particularly by the Hausa and Fulani's of Northern Nigeria. The fresh milk is directly obtained from a cow into a properly washed calabash and kept wide open in the sun for approximately two hours to facilitate separation of the fat layer (Egwaikhide *et al.*, 2014). Some quantity of overnight fermented milk is added therefore, to serve as source of starter culture and the inoculated fresh milk is left overnight at room temperature for fermentation, to get sour milk known as "*Kindirmo*". The addition of large volume of water to the curdle sour milk, which is then stirred with a T-shaped stick to a liquid of fine consistency gives rise to *Nono*.

The poor handling of *Nono* during processing and marketing exposes it to microbial contamination. Houseflies are always found in large numbers at the production sites and at sale outlets which also serves as carrier of contaminate. According to Shehu and Adesiyuh (1990) that the Fulani people in order to increase the volume and improve colour of *Nono*, the female hawkers, prior to sale, engage in the fraudulent act of adding stream water and a milky white supernatant of water-soaked baobab tree seeds. This act could further lead to the contamination and spoilage of this product.

This study was carried out to assess the chemical and microbiological quality of locally fermented cow milk (*Nono*) on sale at Bayero University, Kano, Nigeria.

MATERIALS AND METHODS

The research was conducted in the Old and New campuses and Aminu Kano Teaching Hospital campuses of Bayero University, Kano located on the coordinate; 11.9781° N, 8.4755° E, 11.9729° N, 8.4258° E, 11.9634° N, 8.5504° E and on the average elevation of 573.3m above the sea level respectively. The University campuses are located in the Sudan Savannah region of Nigeria.

Three samples each of 120mL from each of the campuses; Old campus and New campus and Aminu Kano Teaching Hospital were collected from different selling points at random into a clean plastic cap

pre labelled bottle and then transferred to the animal science laboratory of Faculty of Agriculture and microbiology laboratory of faculty of life science, Bayero University, Kano where it was stored at -5°C before the analysis.

Data obtained from the research were subjected to Analysis of Variance (ANOVA), using one – way classification, Least significant difference (LSD) test was carried out at $p < 0.05$ to determine whether there was significant difference between the means (Mukhtar, 2013)

pH was determined using a digital electronic pH meter (Inolab WTW Series 720) after calibrating it using standard buffer solutions of pH 4 and 7. Total solids, moisture contents and Ash were determined using the method describe by Association of official analytic chemists, AOAC (1995). Fat contents were determined using Gerber method as described by Marshall (1993). Total solids-not-fat (SNF) was determined by taking the difference between % total solids and % fat content as described by Igbabul *et al.* (2014). Protein content was determined using the macro Kjeldahl method as described by Oladipo *et al.* (2104). Nutrient agar plates were incubated at 30°C for 24 hours for aerobic mesophilic bacterial count. Coliforms were determined by the Most Probable Number (MPN) method for a five tube series using lactose broth incubated at 37°C for 24 hours. Salmonella, E.coli and Staphylococcus, were detected using salmonella Shigella agar (SSA), Eosin Methylene Blue (EMB) and Mannihot agar respectively at 35°C for 24 hours.

RESULTS AND DISCUSSION

Table 1: Proximate Composition (%) of *Nono* on sale at the campuses of Bayero University, Kano

LOCATION	Parameters						
	Total Solids	CP	SNF	Ash	pH	Fat	Moisture
OLD campuses	43.00	4.10	38.90	0.34	6.97	3.43	77.07
AKTH	56.00	3.70	53.13	0.47	6.27	3.20	61.92
NEW campuses	41.67	3.17	38.70	0.29	6.87	2.83	89.96
Level of significant (0.05%)	NS	NS	NS	NS	NS	NS	NS

The mean pH of *Nono* samples collected from the campuses ranged between 6.27 – 6.97 and there was no significant difference across the campuses at (0.05%). This result is not in line with what El-Bakri and El- zubeir (2009) and Okonkwo (2011) obtained in their study but close to 5.51 - 6.29 obtained by Adesokan *et al.*; (2011) and 5.7 reported by Obi and Ikenebomeh (2007). The values of the pH obtained were not within the standard limits. The mean percentage of protein ranges from 3.17 – 4.10 without significant difference across the campuses. The result obtained in this study exceeds the permissible limit of 3% by FAO (2004). However, this is lower compared to what Obi and Ikenebomeh (2007) reported on their study on *Nono* in Benin-City and lower than the values 5.70 – 6.40% obtained by Dandare *et al.* (2014) in Sokoto. The mean fat content fell between 2.83% to 3.40%. The Fat content obtained in this study was quiet low compared to fat content of 6.54% reported by Egwaikhide *et al.* (2014) in Kaduna but higher than 2.53% reported by Okeke *et al.* (2016) in Bida. The values for fat content obtained in this study are within the FAO (2004) standards of 3.5%. The percentage total solid ranged between 41.67 to 56.00% which is higher than 12.8 - 13.2% reported by Eissa *et al.* (2011) in Sudan and 11.53 – 13.11% reported by Akinlade *et al.* (2017) in Oyo also higher than 6.3 – 9.5% reported by Egwaikhide *et al.* (2014) in Kaduna. The mean ash content of the *Nono* samples analysed fell within 0.29 – 0.47% with AKTH having the highest (0.47%) and the lowest being new campus (0.29%). These results are lower than 1.22 – 1.75% reported by Okeke *et al.* (2016) and comparable to 0.19 – 1.80% obtained by Egwaikhide *et al.* (2014). There is no significant ($p \leq 0.05$) difference between the campuses means of ash content. The moisture content obtained in this study ranged from 61.92 - 89.96%. The mean value obtained in this study was comparable to moisture content of 86.99 % reported by Yamamota *et al.* (2010) in Japan and 84.80 – 85.20% reported by Salau and Bolakale (2012) in Minna but slightly higher than 87.42% reported by Mirzadeh *et al.* (2010) in Lordegan Region of Iran. The moisture content obtained in this study is within FAO (2004) standards. The mean solids-not-fat (SNF) content of the *Nono* samples in the study area ranges from 38.70 – 53.13% with AKTH recording highest 53.13% followed by old

Table 2: Aerobic Mesophilic Bacterial Count (Cfu/ml) Of *Nono* on Sale at the Campuses of Bayero University, Kano.

Location	Mesophilic count			standard error	mean
	1	2	3		
Old campus	TNTC	1.21×10^3	3.7×10^2	6.2×10^1	5.3×10^1
AKTH	5.4×10^5	3.4×10^5	1.6×10^5	1.9×10^1	3.5×10^1
New campus	2.31×10^6	3.71×10^4	7.9×10^3	1.46×10^2	2.27×10^2

TNTC = Too numerous to count

campus 38.90%. However, the means of the solids-not-fat content of the *Nono* samples from the different campuses did not show significant difference at 5% level of significance (table 1). The overall mean of solids-not-fat content in the present study disagrees with the findings of Gemechu *et al.* (2015) and the findings of Teklemichael *et al.* (2015) who recorded the overall means of 8.59% and 8.00% respectively. Also, the average solids-not-fat content of the *Nono* samples obtained was higher than the findings of Bille *et al.* (2009) and Fikrineh *et al.* (2012) who reported higher values of 8.70% and 9.10% respectively from raw cow's milk samples. According to the European Union established quality standards for cow milk and milk products, solids-not-fat content should not be less than 8.50% (Tamime, 2009).

The bacterial load for old campus, AKTH and new campus ranges from 3.7×10^2 – TNTC cfu/ml, 1.6×10^5 – 5.4×10^5 cfu/ml and 7.9×10^3 – 2.31×10^6 cfu/ml respectively. The samples from AKTH and sample one (1) of new campus record the highest bacterial loads which exceed the standard of 1×10^5 recommended by Bergdoll (1988) while sample 2 and 3 of old campus and new campus were within the recommended standard.

CONCLUSION

From the findings of this study, it is concluded that *Nono* put on sale in the study area as at the time of this research was not safe for public consumption and can be a source of milk-borne infections since some of the chemical and microbiological qualities evaluated were not within the recommended and acceptable standards. This is supported by evidence of changes in some of the physiochemical and microbiological properties of the product evaluated.

Recommendation

Further research should be carried out to confirm whether the *Nono* sold at the campuses are truly from milk source or non-milk substances.

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