

Bacteriological Quality of Burukutu Sold in Afikpo Ebonyi State Nigeria

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Abstract- This research is aimed at isolation and identification of bacteria associated with burukutu sold in Afikpo. Two samples of burukutu were randomly purchased from the sellers at two different joints in Enugu State and analyzed using standard microbiological methods. The results of the analysis indicates that the aerobic plate count of the isolates from sample A and B indicates that sample A had a 3.3×10^2 cfu/ml while sample B had 4.3×10^2 cfu/ml. The total coliform count indicates that sample A 1.1×10^2 cfu/ml while sample B had 3.8×10^2 cfu/g. This result indicates that the total coliform count was higher in Sample B (3.8×10^2 cfu/ml) also the total aerobic count shows that sample B equally had higher count of 4.3×10^2 cfu/ml. The morphological and biochemical analysis of the isolates revealed the recovery of four different genera of bacteria namely: *S. aureus*, *E. coli*, *Bacillus spp.* and *Salmonella spp.* From the foregoing, there is need for improvement on personal hygiene of the producers and sellers of this beverage as most of the bacteria recovered are contaminants from skin, water, utensils and faecal matter of humans.

Indexed Terms- Burukutu, Bacteriological quality, Afikpo

I. INTRODUCTION

Buruku is an African traditional opaque beverage known in different parts of Africa by different names. These names include “ikigage” in Rwanda (Lyumugabe *et al.*, 2012), “tchoukoutou” in Benin and Togo (Kayodé *et al.*, 2005), “dolo” in Burkina-Faso (Dicko *et al.*, 2006), “pito” and “burkutu” in Nigeria and Ghana (Banigo *et al.*, 1987), “doro” and “chibuku” in Zimbabwe (Chamunorwa *et al.*, 2002),

“bili bili” in Chad (Maoura and Pourquie 2009), “bouza” in Ethiopia and “pombe” in some parts of East Africa (Okafor, 2007). These traditional opaque beverages serve as cultural identities for the indigenous people in various parts of Africa (Ogbonna *et al.*, 2016).

According to Lyumugabe *et al.* (2012), traditionally Burukutu is brewed with red or white sorghum variety and/or maize malts. It has a sour taste resulting from the action of the lactic acid bacteria (*Lactobacillus spp.*) and opaque colour because of suspended solid and yeast materials (Adewara and Ogunbanwo, 2013; Ogunbanwo *et al.*, 2013) with thin consistency. Burukutu is consumed among the indigenous people of the northern guinea savannah of Nigeria and other African countries including Ghana and Benin (Banigo *et al.*, 1987). Its brewing process involves malting, mashing, boiling, fermentation and maturation (Lyumagbe *et al.*, 2012). The microorganisms associated with the fermentation of burukutu include *Sacchomyces cerevisiae*, *Sacchomyces chaveliera*, *Leuconostoc mensenteroides* and *Candida acetobacter* (Blandino *et al.*, 2003; Van der Aa Kühle, *et al.*, 2001). Several studies on burukutu and its raw materials have been reported (Uvere *et al.*, 2000; Orji and Uvere, 2002; Kingsley and Victor, 2007; Yahaya, 2008; Lyumugabe *et al.*, 2012; Adewara and Ogunbanwo, 2013). Burukutu has a short shelf-life of 1 – 8 days. The short shelf-life may be due to the low lactic acid content, low alcohol content, high concentration of vitamins and fermentable sugars and the presence of lipoxidation products (Eze *et al.*, 2011) Unfortunately, burukutu is considered a low social status beverage culturally in traditional African societies. People who consume it are regarded as social misfits who cannot afford the cost of the European-style brewed beverage types. In Afikpo, this

drink (burukutu) seems to have won the heart of many residents than other local drink such as “goskul”, “mos” and “palm wine”. In the last 10 years, the number of consumption centres has doubled and has continued to rise. The addiction of these drinks is better seen than imagined, as many young people wake up and start their day at “burukutu” consumption centres, they brush their teeth, take their bath and eventually set themselves for the day on a very “high” frequency, with this favourite drink. They drink to the point that they do not have appetite for food and most time leave the consumption centres with oozing smell. Flies perch around the entire environment exposing the drinks to microbial contamination as nobody cares to cover anything. It is in the light of the aforementioned and many others that this study was undertaken to examine the bacteriological profile of burukutu sold in Afikpo in Afikpo North Local Government Area of Ebonyi State.

II. RESULT

Tab. 1: Aerobic plate count of isolates

Sample	Plate I (cfu/ml)	Plate II (cfu/ml)	Average (cfu/ml)
LTN A	5.2 x 10 ²	1.5 x 10 ²	3.3 x 10 ²
LTN B	7.0 x 10 ²	1.6x10 ²	4.3 x 10 ²

KEY: LTNs A= Location A & B. cfu/ml = colony forming unit/ ml.

The aerobic count of the isolates shows that sample from location B has the highest aerobic count with an average of 4.3 x 10²cfu/g followed with sample A with average of 3.3 x 10²cfu/g (table 1).

Tab. 2: Total coliform plate count of isolates (cfu/g)

Sample	Plate I (cfu/mg)	Plate II (cfu/mg)	Average (cfu/mg)
LTN A	1.2 x 10 ²	1.0 x 10 ²	1.1 x 10 ²
LTN B	6.0 x 10 ²	1.5x10 ²	3.8 x 10 ²

KEY: LTNs A= Location A & B. cfu/g = colony forming unit/ gram.

The coliform count of the isolates shows that sample from location B has the highest aerobic count with an

average of 3.8x10²cfu/g followed with sample A with average of 1.1 x 10²cfu/g (table 2)

Tab. 3: Cultural and morphological characteristics of the isolate.

The cultural and morphological characterization of isolates revealed based on their cultures and shape the presence of many bacteria in the studied burukutu (table 3)

Location	medium	colour	size/	shape	probable isolate
LTN A	NA	Creamy	tiny with rough edges	Cocci	<i>E. coli</i>
		Whitish pink	tiny, elevated	Rod	<i>S. aureus</i>
	MAC	pinkish	tiny with smooth edges	Rod	<i>Salmonella spp.</i>
LTN B	NA	muco id	smooth	rod	<i>Bacillus spp.</i>
	MAC	pinkish	tiny with smooth edges	rod	<i>Salmonella spp.</i>
				rod	<i>Shigella spp</i>

Tab. 4: Biochemical characterization of isolates
The biochemical characterization of the isolates shows the recovery of five genera of bacteria *S. aureus*, *E. coli*, *Bacillus spp.*, *Salmonella spp* (Table 4)

Catalase	citrate	indole	oxidase	urease	glucitol	mannitol	motility	gram	isolate organism
-	+	-	-	+	+	+	-	+	<i>S. aureus</i>

+	-	+	-	-	+	+	+	-	<i>E. coli</i>
+	+	+	-	-	+	+	+	+	<i>Bacillus spp.</i>
+	+	-	-	-	+	+	+	-	<i>Salmonella spp.</i>

III. DISCUSSION

The result of the analysis indicates that the aerobic plate count of the isolates from sample A and B shows that sample had a cfu/ml of 3.3×10^2 while sample B had 4.3×10^2 colony forming unit per gram. The total coliform count indicates that sample A 1.1×10^2 cfu/g while sample B had 3.8×10^2 cfu/g. (table 2). By this, it is evident that the total coliform count was higher in Sample B (3.8×10^2) also the total aerobic count shows that sample B equally had higher count of 4.3×10^2 cfu/g. (table 1). The aerobic count of this present study agrees with that recorded by Lynn *et al.*, (2014). They recorded a value of total bacteria count ranging from $1.11 \times 10^4 - 4.00 \times 10^4$ in nutrient agar medium. However, the total coliform count from this present study was less than the total coliform count of 5.80 ± 0.08 obtained by Anaukwu *et al.* (2015), in their study on Microbiological Analysis of Burukutu Beverage Produced in Southern Part of Nigeria

The cultural features of the isolates indicates that burukutu in this present study was contaminated by many genera of bacteria (table 3). The biochemical analysis of the isolates indicates the recovery of four different bacteria namely: *S. aureus*, *E. coli*, *Bacillus spp.* and *Salmonella spp.*

The recovery of these organisms (*S. aureus*, *E. coli*, *Bacillus spp.* and *Salmonella spp.*) agrees slightly with the work of Eze *et al.*, (2011) when in their study of the microbiological and nutritional qualities of burukutu sold in mammy market Abakpa, Enugu identified the presence of. However, this present study also agrees with the work of Kolawole *et al.*, (2007)

when in their work on the proximate and microbial analysis of burukutu and pito produced in Ilorin, Nigeria isolated *E. coli*, *Bacillus subtilis*, *S. aureus*, *Streptococcus spp.* etc. The presence of these organisms in this product calls for serious health concern as they are known to be of medical importance. The position agrees with the observation of many authors.

S. aureus though is a normal flora of the skin can still cause infections in man. This is in line with the observation of Ellen and Sndney (1990) when they argued that *S aureus* is a normal flora of the skin and mucus membrane and a common etiologic agent of septic arthritis.

However, *Salmonella sp.* as recovered in this present study is an indication possible feacal contamination that might have been introduced through the water that was used in the burukutu preparation. Our position is buttressed by Lynn *et al.*, (2014) when they noted that the presence of *Salmonella spp.* in the alcoholic beverage could be attributed to the contaminated water used for germination sprout and poor environmental condition surrounding the burukutu house.

CONCLUSION

The present study revealed the presence of many genera of bacteria associated with burukutu drink sold in Afikpo metropolis. The bacteria recovered seem to be of medical health importance and as such there is need to adopt measures that will help in eradicating or reducing the rate of contamination and or contraction of food-borne infections that could arise from the consumption of burukutu. It is on this end that the researcher among other recommendations suggested the use of public health workers to ascertain the microbial status of burukutu sellers, awareness on the improvement of personal hygiene on both buyer and sellers of burukutu in Afikpo. There is need for improvement of the personal hygiene of the producers and sellers of this beverage as most of the organisms recovered are contaminants from skin, water, utensils and faecal matter of humans. The consumers of burukutu should as a matter of health importance, see that the environment at which these products are sold is clear before they can accept to patronize the seller.

REFERENCES

- [1] Adewara, A. O., & Ogunbanwo S. T. (2013). Effects of processing variables on the production of 'burukutu', a Nigerian fermented beverage. *Nature and Science*, 11(1): 16 – 28.
- [2] Anaukwu, C. G., Nwagwu, F. C., Okafor, O. I., Ezemba, C. C., Orji, C. C., Agu, K. C. and Archibong, E. J. (2015). Microbiological analysis of Burukutu Beverage Produced in Southern Part of Nigeria. *European Journal of Experimental Biology*, 5(8):18-22
- [3] Banigo, E. O., Aina, A. & Ossai, G. E. (1987). A study of the traditional burukutu manufacturing practice in Nigeria. *Journal of Food and Agriculture*, 2: 83-89.
- [4] Blandino, A., Al-Aseeri, M.E. Pandiella, S.S., Cantero, D., & Webb, C. (2003). Cereal-based fermented foods and beverages. *Food Research International*, 36: 527-547.
- [5] Chamunorwa, A.T., Feresu, S.B. & Mutukumira, A. N. (2002). Identification of lactic acid bacteria isolated from opaque beer (Chibuku) for potential use as a starter culture. *Journal of Food Technology in Africa*, 7, 93-97.
- [6] Dicko, M.H., Gruppen, H., Traoré, A.S., Voragen, A.G.J., & Berkel, W.J.H. (2006). Sorghum grain as human food in Africa: relevance of content of starch and amylase activities. *African Journal of Biotechnology*, 5(5): 384-395.
- [7] Ellen, J. B. and Sdney, M. F. (1990). *Balley and Scott Diagnostic Microbiology* (8th ed.). Pp. 293-294.
- [8] Eze, V. C., Eleke, O. I. and Omeh, Y. S. (2011). *American Journal of Food and Nutrition* 1(3): 141-146.
- [9] Kayode, A.P.P., Aégbidi, A., Linnemenn, A.R, Nout, M.J.R. & Hounhouigana J.D. (2005). Quality of farmer's varieties of sorghum and derived foods as perceived by consumers in Benin. *Ecology of Food Nutrition*, 44: 271-294.
- [10] Kingsley, C.E. & Victor, E.E. (2007). A kinetic study of burukutu fermentation. *Journal of Engineering and Applied Sciences*, 2(7), 1193-1198.
- [11] Lyumugabe, F., Gros, J., Nzungize, J., Bajyana, E., & Thonart, P. (2012). Characteristics of African traditional beers brewed with sorghum malt: a review. *Biotechnology Agronomy Society and Environment*, 16(4), 509-530.
- [12] Lynn, M., Alibe, W., Brisca, J. and De, N. (2014). Isolation of Some Pathogens in Burukutu, a Local Drink, Sold in Sengere Village, Girie Local Government, Adamawa State. *Greener Journal of Microbiology and Antimicrobials* 2(1): 001-006,
- [13] Maoura, N. & Pourquie, J. (2009) Sorghum beer: production, nutritional value and impact upon human health. In V.R. Preedy (Ed.), *Beer in health disease prevention*, (pp. 53-60). Burlington, MA, USA: Elsevier Academic Press.
- [14] Ogonna, A. C., Abuajah1, C. I., and Umanah, A. I. (2016). Burukutu: Healthy and Superior Indigenous African Traditional Opaque Beverage. *American Journal of Advanced Food Science and Technology* 4(1): 29-37
- [15] Ogunbanwo, S. T., Adewara, A. O., & Fowoyo, P. T. (2013). Effect of fermentation by pure cultures of *Lactobacillus fermentum* and *Saccharomyces cerevisiae* as starter cultures in the production of 'burukutu'. *New York Science Journal*, 6(1), 73 – 81.
- [16] Okafor, N. (2007). *Modern industrial microbiology and biotechnology*. U.S.A: Science Publishers.
- [17] Orji, G. S. & Uvere, P.O. (2002). Lipase activity during malting and fermentation of sorghum for burukutu production. *Journal of Institute brewing*, 108(2), 256-260.
- [18] Uvere, P.O., Adenuga, O.D. & Mordi, C. (2000). The effect of germination and kilning on the cyanogenic potential, amylase and alcohol levels of sorghum malts used for burukutu production. *Journal of the Science of Food and Agriculture*, 80: 352–358.
- [19] Van der Aa Kuhle, A., Jesperen, L., Glover, R.L.K., Diawara, B., & Jakobsen, M. (2001). Identification and characterization of *Saccharomyces cerevisiae* strain isolated from West African sorghum beer. *Yeast*, 18: 1069-1079.

- [20] Yahaya, A. (2008). Microorganisms associated with starter cultures of traditional burukutu liquor in Madakiya, Kaduna State. Nigeria. *Science World Journal*, 3: 9-11.