

Occurrence of lactic acid bacteria in some locally fermented food products sold in Minna markets

S.B. Oyeleke, A.K. Faruk, O.A. Oyewole, and H.Y. Nabara.

Department of Microbiology, Federal University of Technology, Minna. Niger State.

Thirty-seven (37) samples of five locally fermented food products (nono, fufu, ogi, man-shanu and wara) sold in Minna markets were analyzed for the presence of lactic acid bacteria (LAB). Twenty-five samples harbored LAB. The counts of microorganisms varied in the samples analyzed. The highest LAB count (8.13×10^6) was recorded for "Nono", while the least count of 1.26×10^6 occurred in Man-shanu. The microbial isolates were identified as *Lactobacillus bulgaricus*, *Lactobacillus lactis*, *Lactobacillus acidophilus*, *Streptococcus cremoris* and *Streptococcus thermophilus*. The frequencies of occurrence of the different species are: *L. bulgaricus* (29%), *L. lactis* (6.4%) *L. acidophilus* (29%), *S. cremoris* (9.6%) and *S. thermophilus* (25.8%). These organisms may be responsible for the preservation and production of desirable flavour in some of the locally fermented food products.

INTRODUCTION

Lactic acid bacteria (LAB) refer to a large group of beneficial bacteria that have similar properties and all produce lactic acid, an end product of the fermentation process (Odunfa, 1985). The growth of these organisms provides acidification process, which lowers the pH to 4.0, thus, inhibiting the growth of other microorganisms including some human pathogens, thus prolonging the shelf life of the food. The acidity also changes the texture of the food due to precipitation of some proteins and the biochemical conversions involved in growth to enhance their flavour (Oyewole and Odunfa, 1990).

The name 'lactic acid bacteria' emphasize the commercially important aspect of their metabolism. The term is commonly used in food science and

traditionally has become associated with the genera *Lactobacillus*, *Leuconostoc*, *Pediococcus* and *Streptococcus* (Odunfa (1985). Alukoya (1989) in his study on 'Nono' isolated *Lactobacillus acidophilus*, *Streptococcus lactis*, and *Staphylococcus* spp. Casla *et al.* (1996) reported the isolation of *Lactobacillus*, *Streptococcus* and *Staphylococcus* spp from milk product. Hausler *et al.* (1974) reported that milking personnel may serve as source of contamination when these personnel are laden with infections through sneezing, coughing or talking during milking. Milking equipment like tanks and milking machines are the frequent sources of contamination. The udder of lactating cow also provides a good breeding ground for microbes (Nester *et al.* 1998). Odunfa and Akinlere (1985) worked on "Kamu" a fermented

cereal-based food and isolated *L. plantarum* as the predominant organism responsible for lactic acid production.

The aims of this research are to isolate and characterize the lactic acid bacteria present in some locally fermented food products.

MATERIALS AND METHOD

Sample collection

Ten samples of each of the following products: "Wara", "Nono", "Man-shanu", "Kamu" and "Fufu" were purchased from hawkers from different locations in Minna, Niger State; Nigeria which include: Tunga market, Mobil (Central) market, New market and Bosso market and transported in sterile sampling bottles to the microbiology laboratory of Federal University of Technology, Minna, Niger State for analysis.

Preparation of culture media

The culture media used for this study were prepared following standard laboratory methods as described by Cheesebrough (2003). The following different culture media were used for this study. Nutrient broth, nutrient agar (NA) and lactic agar medium which was composed of agar agar 3.75g, tryptone 5g, and yeast extract 1.25g, gelatin 0.63g, glucose 1.25g, lactose 1.25g, and sucrose 0.13g. The above compositions were dissolved in 250ml of distilled water, sterilized in the autoclave at 121°C for 15 minutes. This medium is selective for the growth of lactic acid bacteria.

Isolation of lactic acid bacteria (Lab)

The pour plate method was used. Nine milliliters amount of normal saline was dispensed into McCartney bottles

with suitable cap and was sterilized in the autoclave at 121°C for 15 minutes.

Thereafter a serial ten-fold dilution was made to make up to 10^{-1} dilution and was pipetted into 9ml sterile water of which 1ml is transferred into the next McCartney bottle to make dilution 10^{-2} . Dilution 10^{-5} was inoculated into the lactic agar and incubated at 37°C for 24 – 48 hours for presence of LAB. Colonies, which appeared in the plate, were counted and recorded as colony forming units per milliliter or gramme of sample. Pure cultures were obtained by repeated sub culturing on fresh media.

Characterization and identification of isolates

Microbial isolates were characterized and identified based on the descriptions by Cowan (1974) and Cheesebrough (2003).

RESULTS

Microbial counts

Twenty-five out of the 37 locally fermented foods analyzed contained lactic bacteria (LAB). Most "Nono", "Wara", and "Kamu" samples had the organisms in them while a greater number of "manshanu" samples did not contain the organisms (Table 1). In terms of counts, "nono", "fufu" and "kamu" had higher counts than "wara" and "manshanu" (Table 1).

Identification of isolates

The following organisms were isolated from five different samples (nono, fufu, wara, manshanu and kamu): *Lactobacillus bulgaricus*, *L. acidophilus*, *L. lactis*, *Streptococcus cremoris* and *S. thermophilus*.

Table 1. Total viable lactic acid bacterial counts in selected fermented food products

Fermented food product	No. of samples collected	No. of samples with Lab	Total counts of Lab (cfu/ml or cfu/g)
Nono	8	6	$4.78 \times 10^6 - 8.13 \times 10^6$
Wara	7	6	$1.56 \times 10^6 - 3.25 \times 10^6$
Man-shanu	7	3	$1.26 \times 10^6 - 2.10 \times 10^6$
Fufu	7	4	$2.20 \times 10^6 - 3.75 \times 10^6$
Kamu	8	6	$2.60 \times 10^6 - 3.60 \times 10^6$
Total	37	25	

Frequency of occurrence of isolates

Lactobacillus bulgaricus and *L. acidophilus* were more frequently isolated (29%) each. These were differentiated following their reaction to lactose, sucrose, maltose and galactose. *L. bulgaris* was positive to lactose and galactose the later were positive to the above four sugars and were followed by *S. thermophilus* with (25%), *S. cremoris* had (10.6%) and *L. lactis* had (6.4%) respectively. It was observed that *L. lactis* and *S. cremoris* were not detected in "man-shanu", "fufu" and "kamu". Similarly, *L. acidophilus* was not detected in 'man-shanu'.

DISCUSSION

The locally fermented food products "Nono", "wara", "man-shanu", "kamu" and "fufu", analysed contained lactic acid bacteria (LAB) in varying numbers. The organisms isolated include: *Lactobacillus bulgaricus*; *L. lactis*; *L. acidophilus*; *Streptococcus thermophilus* and *S. cremoris*. The presence of LAB in locally fermented foods has been reported by other investigators Odunfa (1985); Kuboye (1985) and Olukoya (1993) on "Nono", "fufu", and "kamu" that had a higher counts of LAB than "wara" and "man-shanu" probably due to improper handling which was supported by the report of Adams and Moss (1995).

However, the presence of lactic acid bacteria in locally fermented foods is an advantage in that they add flavour to the food or finished products and reduce the pH of foods thereby discouraging the growth of most spoilage bacteria (Ray and Daeschel, 1992).

L. bulgaricus and *L. acidophilus* were more frequently isolated (29%) each and the least *L. lactis* (6.4%) (Table 1). The LAB load of the sample purchased revealed that 'nono' had the highest LAB counts ($4.78 \times 10^6 - 8.13 \times 10^6$) cfu/ml followed by 'fufu' ($2.20 \times 10^6 - 3.75 \times 10^6$) cfu/g and the least was 'man-shanu' ($1.2 \times 10^6 - 2.10 \times 10^6$) cfu/g. Lactobacilli are important in food fermentation as well as the production of bacteriocin (Adams and Moss, 1995; Alexander *et al.*, 1996). Bacteriocins are used against food-borne pathogens (additives). Therefore, the isolates obtained in the present study can be exploited for the production of bacteriocin.

Streptococcus thermophilus are also important in fermented milk products like yoghurt. These organisms work in symbiotic with *L. bulgaricus* to ferment milk for the production of yoghurt (Kuhlein and Receveur, 1996). Thus, these organisms are used as starter cultures for commercial production of yoghurt. Lactic acid bacteria pose no threat to the health of the individual that

consume these products as reported by Kleijn *et al.* (1995).

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