THE PHYSICO-CHEMICAL QUALITIES OF 'NONO' FERMENTED AT DIFFERENT TEMPERATURES

M. O. BANKOLE[1] AND R. N. OKAGBUE

Department of Microbiology, Ahmadu Bello University, Zaria, Nigeria

Received 2 September, 1995; Accepted 26 September, 1996

ABSTRACT

The effects of fermentation at temperatures of 15°C, 25°C, 30°C and 37°C on the physico-chemical and sensory qualities of 'nono', a fermented milk products were determined. Of the four temperatures used, milk fermented at 25°C and 30°C produced the most suitable and acceptable 'nono'. While diacetyl, a flavour enchancer was 1.0μg/ml and 3.2 μg/ml in 'nono' fermented at 25°C and 30°C respectively, it was zero μg/ml at 15°C and 6.3 μg/ml at 37°C temperatures of fermentation. The pH readings at 24 hours of milk fermented at 25°C and 30°C temperatures of fermentation were 4.9 and 4.8 respectively, while at 15°C and 37°C temperatures of fermentation , pH, readings were 5.1 and 4.3 respectively. The taste panellists assessment of 'nono' favoured 25°C and 30°C temperature of fermentation more than 15°C and 37°C.

KEYWORDS: Physico-chemical qualities, "nono", milk, temperature.

INTRODUCTION

Milk is an important product in the pastoral and agro-pastoral system of northern Nigeria as well as the small-holder Peri-urban systems of humid southern Nigeria. In these systems, milk is consumed either fresh or processed into sour products which are sold in nearly all markets. Fermentation is a natural process of food preservation. Fermenting milk reduces its pH which limits the growth of putrefactive and lipolytic bacteria. Nono is one of the fermented (sour) milk food products in Nigeria. The production and consumption of 'nono' is widespread in the subhumid and semi-arid areas of Nigeria particularly with the Fulanis. Jansen (1992) found that 58% of the total sampled population around Kaduna town consumed sour milk ('Nono") at least once a week and showed that 'nono' had an over-riding importance in the pattern of dairy product consumption in and around Kaduna which he considered representative of northern Nigeria.

Earlier works have studied the local production, quality and characteristics of 'nono' (Eka and Ohaba, 1977; Akinyanju, 1989; Bankole and Okagbue, 1992; Okagbue and Bankole, 1992). The processing temperature of locally produced nono depends on the environmental temperature at time of processing. During the harmattan period, covered calabash containing the milk for nono production are kept in corners of rooms to get the warmth needed for fermentation. Given the increasing importance of this product in the diet of many Nigerians, the need to look into the aspects of controlled fermentation with a view to developing technologies appropriate to small-holder producers becomes very topical and relevant. This paper therefore reports on the effects of different fermentation temperatures on the quality and acceptability of 'nono'.

MATERIALS AND METHODS

Samples of milk were obtained from Hanwa, Bomo and Biye Villages around Zaria in Kaduna State of Nigeria. The chemical composition of the milk was determined following the A.O.A.C. (1984) procedure. The milk was then fermented at different temperatures of 15°C, 25°C, 30°C and 37°C. The effects of these temperatures on pH, titratable acidity, diacetyl content as well as the

[1]*Department of Biological Sciences, University of Agriculture, Abeokuta. Department of Biological Sciences, University of Agriculture, Abeokuta.*

acceptability of the products were determined using procedure described by Bankole and Okagbue (1992).

The physical (colour, odour, texture and viscosity) and sensory (taste) qualities and overall acceptability of the 'nono' fermented at these different temperatures were assessed by a taste panel of 10 using a structured questionnaire. The panelists were instructed to rinse their mouths properly after tasting each sample. Qualities assessed by them included colour; odour; taste, viscosity;thickness; Texture/ smoothness; and overall quality/acceptability. These were quantified as acceptable or unacceptable. The assessment of the panelists were subjected to the ANOVA test. This is to show the variability among the fermentation temperatures, in an attempt to indicate the temperature(s) that contribute(s) favourably to the fermentation of 'nono'.

RESULTS AND DISCUSSION

For the milk used in this study, though bulk-sampled from different cows which were in various stages of lactation, the average chemical contents fell within the range reported for the Bunaji cattle. The milk was neither pasteurised nor exposed to any form of heat or light. This, was believed, would protect the heat-labile nutrients and the water soluble vitamins in the milk (Rolls and Porter, 1973).

Figures 1-3 show the effect of different temperatures of fermentation on the physical and chemical contents of 'nono' at 0hr to 24hrs of fermentation. The pH pattern (Fig. 1) at 37°C dropped sharply from pH 6.7 to 4.7 at 6 hours of fermentation and dropped gently to 4.2 at 24 hours of fermentation. The pH patterns at 25°C and 30°C were similar, dropping slightly to 6.3 at 6 hours of fermentation. Fermentation at 37°C produced a pH of 4.7 at 6 hours of fermentation; the pH which was produced at 12 hours of fermentation at 25°C and 30°C but not achieved at all at 15°C as the pH at 24 hours of fermentation was 5.1. Titratable Acidity (TTA) at 25°C and 30°C fermentation temperatures were also similar and highest among the four temperatures tested (Figure 2). It was probable that the lactic acid content at 37°C was easily converted to other end products, the temperature of 37°C favouring higher enzymatic reaction. These other end products probably tinted the taste of 'nono' produced at 37°C.

The diacetyl content increased with increases in temperature and time of fermentation. At 24 hours of fermentation, diacetyl contents at 25°C and 30°C were 0.8µg/ml and 3.4 µg/ml respectively while at 37°C, it was 6.5µg/ml (Figure 3). Diacetyl is known to give flavour in a fermented product (Jay, 1978) and might have been responsible for the acceptability pattern of nono processed at different temperatures. The diacetyl content in 24 hours of fermentation at 37°C was very high compared to those at 25°C and 30°C.

The ANOVA test showed temperatures of 25°C and 30°C as the best levels of temperatures for the fermentation of 'nono' on the basis of the parameters of assessment by the panellists (Table 1).

Incidentally, these temperatures happened to be the range of temperatures at which 'nono' is traditionally

TABLE 1: THE PERCENTAGE ACCEPTABILITY SCORE OF PANELLISTS' ASSESSMENT OF 'NONO' PROCESSED AT FOUR DIFFERENT TEMPERATURES.

Quality Attributes	Assessment Scores Fermentation Temps. (°C)			
	15	25	30	37
Colour	90	10	10	14
Odour	4	90	90	6
Taste	2	80	80	30
Viscosity	6	94	90	24
Texture	0	90	88	20
Overall acceptability	0	90	90	20
Total	102[a]	454[b]	448[b]	114[a]
Mean	17.0[a]	75.7[b]	74.7[b]	19.0[a]

a,b, = *Means in different columns with different superscripts are significantly different (P < 0.05)*

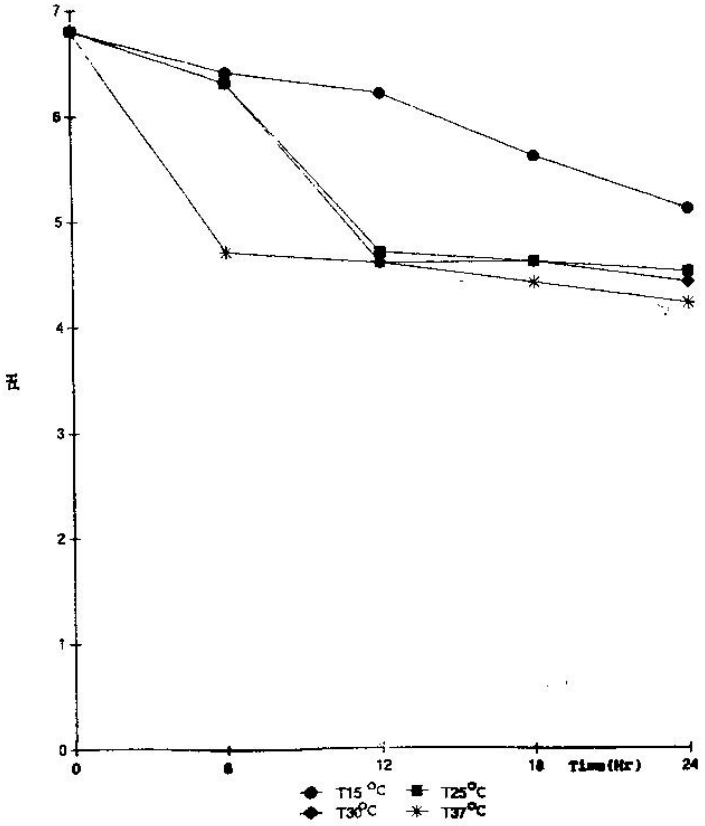

Figure 1: Effects of the temperature of fermentation on the changes in pH during "nono" production.

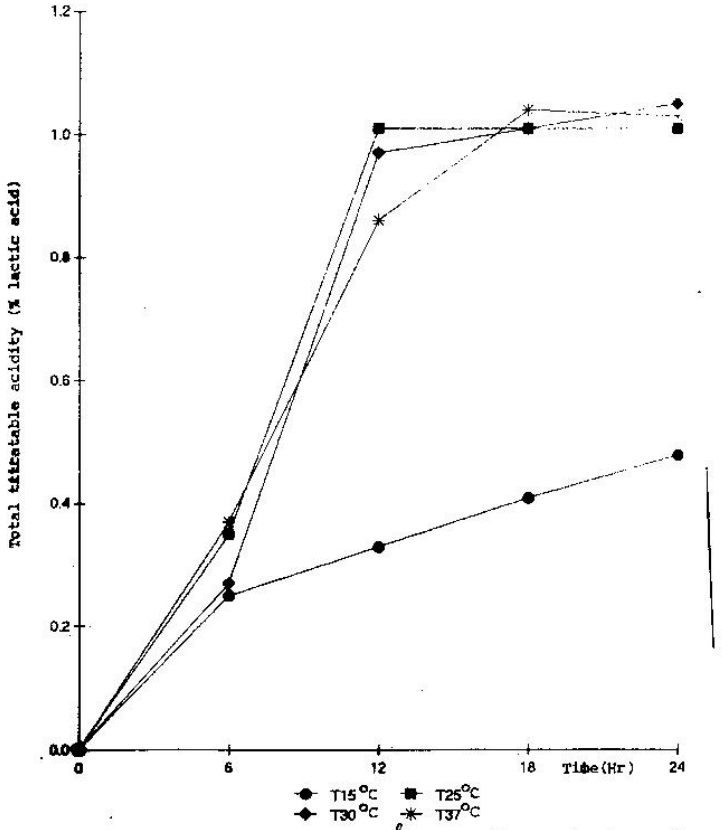

Figure 2: Effects of temperature of fermentation on the changes in the total titratable acidity (TTA) during "nono" production.

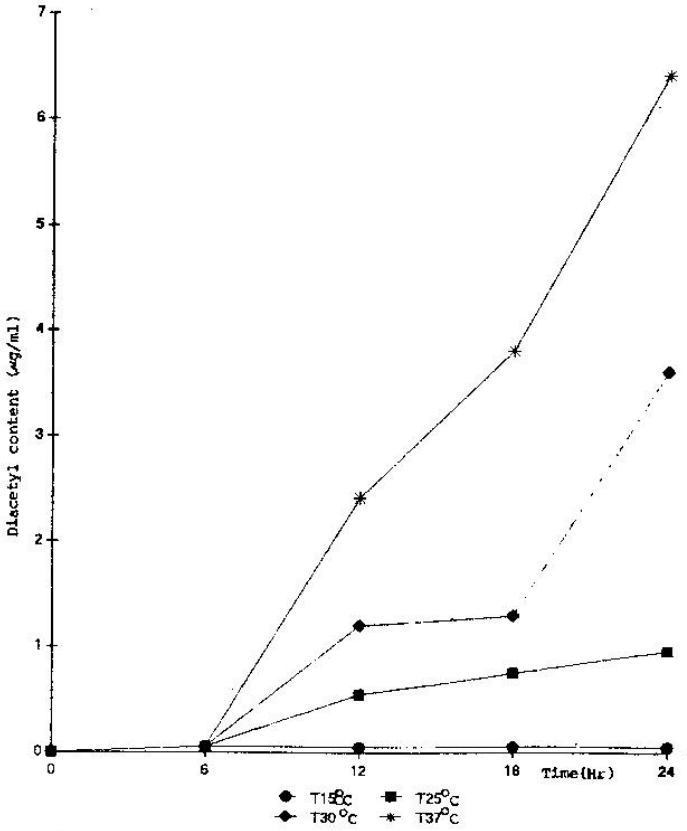

Figure 3: Effects of temperature of fermentation on Diacetyl content during "nono" production.

produced and at which lactic streptococci, known to be responsible for 'nono' production from milk (Okagbue and Bankole, 1992), best produce acid (Golding et al,. 1943). It can be concluded that a temperature range of 25°C to 30°C is the most suitable for the production of good quality and acceptable 'nono'.

REFERENCES

AKINYANJU, J.A. (1989). Characteristics and production process of 'Nono" - A Nigerian fermented food. Chem. Mikrobiol Technol Lebensm 12, 14-19.

A.O.A.C. (1984). Official methods of Analysis. 14th ed. Association of Official Analytical Chemists. Arlington, V.A.

BANKOLE, M.O. and OKAGBUE, R.N. (1992). Properties of "Nono" A Nigerian fermented milk food. Ecology of Food and Nutrition 27: 145-149.

EKA, O.U. and OHABA, J.A, (1977). Microbiological examination of Fulani milk (nono) butter (manshanu). Nigerian J. Sci. 11: 113-122.

GOLDING, N.S.; AMUNDSON, H.; and WAGERNAAR, R.O. (1943). Factors affecting the development of acidity in pasteurized skim milk inoculated with commercial lactic starters J. Diary Sci., 26: 909-920.

JANSEN, HANS G.P. (1992). Consumption of dairy products in northern Nigeria. In: "Dairy marketing in sub-Saharan Africa". (Ray. F. Brokken and Senait Seyoum, eds) ILCA Addis Ababa, Ethiopia. 159-184.

JAY, J.M. (1978). Modern Food Microbiology. 2nd Ed. P.225 - 290. D. Van Nos. trand company, Publ. N.Y. 10001.

ROLLS, B.A. and PORTER, J.W.G. (1973). Some effects of processing and storage on the nutritive value of milk and milk products. Pro. Nutr. Soc. 32: 9-12.

OKAGBUE, R.N. and BANKOLE, M.O. (1992). Use of starter cultures containing Streptococcus diacetilactis, Lactobacillus brevis and Saccharomyces cerevisae for fermenting milk for production of Nigerian Nono. World Journal of Microbiology and Biotechnology 8: 251-253.