

ASSESSMENT OF NUTRITIVE AND MICROBIOLOGICAL QUALITIES OF LOCALLY PREPARED CHEESE (WARA) RETAILED IN ONDO STATE

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Abstract

This study was conducted to access the nutritive quality and microbial status of locally prepared cheese (Wara) retailed in Ondo State. Fresh samples of cheese were collected from three locations in Ondo state namely; Akure, Ondo and Owo. Three samples were collected from each location and each sample was replicated thrice. The experimental design was the completely randomized design. The proximate and microbial analyses were determined using standard procedures. Significant differences ($P < 0.05$) were observed in Ash, Crude protein, Fat and Lactose while the dry matter was not significantly ($P > 0.05$) affected as values ranged from 44.59 – 45.05%. Cheese samples from Ondo town had the highest protein, Ash, and Lactose contents of 20.99, 0.75 and 0.42% respectively. Cheese from Owo had the least protein (17.84%) and Lactose (0.32%) contents but had the highest fat content (17.62%) while samples from Ondo town had the least value (14.42%). The bacteria identified in the cheese samples were *Micrococcus leteus*, *Staphylococcus aureus*, *Lactobacillus* spp, *Streptococcus* spp and *Serratia marcesces*. The total bacteria colony count of cheese from Ondo had the highest bacteria count of 128.24×10^4 cfu/ml, while that obtained from Owo had the lowest total bacteria count of 25.25×10^4 cfu/ml. The results showed that cheese retailed in Ondo was mostly contaminated compared to those from Akure and Owo towns.

Key Word: cheese, microbiological, nutritive, Ondo state, retailed

Introduction

Milk is a main source of animal protein, it can be consumed either fresh or processed into other products that are acceptable by people (FAO, 1990). Milk is a highly perishable product and due to the difficulties in its preservation especially in developing countries, attempts of technological approaches were developed in order to transform fresh milk into added value products (Dossou *et al.*, 2006) such as cheese (Wara). Wara is an unripened cheese consumed in several parts of West Africa, the cheese production is based on the principle of enzymatic or acidic reactions which coagulates milk. However, during the processing of milk, the nutritional quality and hygiene of the product could be compromised thus making the product highly susceptible to contamination and predisposing consumers to food-borne diseases. In view of this, there is a need to determine the nutritive and microbial qualities of cheese retailed in Ondo State using three locations.

Materials and Methods

Collection of Samples: Fresh samples of cheese were collected from three locations in Ondo State namely; Akure, Ondo and Owo. The samples were collected from three retailers from each location and replicated thrice in sterilised

containers and stored in a freezer till the following morning when analyses of the samples commenced.

Analyses

The proximate composition was done according to AOAC (1990), microbiological evaluation and characterisation (Harrigan and McCance, 1976; Olutiola *et al.*, 1999 respectively).

Statistical Analysis: The completely randomised designed was adopted. Data obtained were analysed using ANOVA and significant means were separated using Duncan's multiple range test using the SAS (2008) version 9.2.

Results and Discussion

The proximate composition of cheese revealed significant difference ($P < 0.05$) in the crude protein, ash, lactose and fat contents. The crude protein content of cheese sample from Ondo had the highest value of 20.99 ± 0.20 compared to Akure 19.98 ± 0.20 and Owo (17.84 ± 0.20) respectively. These values are higher than 5.33%, 4.45% reported by earlier researchers (Frazier and Westhoff, 1988 and Fasakin and Unokiweri, 1992 respectively). Cheese from Ondo town had the highest ash value (0.750.09), while samples from Akure had the lowest value (0.34 ± 0.09). These

variations could be due to difference in location, breed of cow, feed offered and stage of lactation of the cows milked for the study. However, there was no significant difference ($P > 0.05$) in the dry matter of cheese obtained in the three towns with values ranging from 44.59-45.05±0.17. The highest value 45.05±0.1 recorded for samples from Ondo town was however, lower than the values 69.23% and 64.0% obtained by Oladipo and Jadesimi, (2005) and Uaboi-Egbenni *et al.* (2010) respectively but similar with the findings of Nazim *et al.* (2013) who had a value of 45.240.83. The isolated organisms from cheese sample from Akure had the highest number of isolates of five different types of organisms (*Micrococcus leteus*, *Staphylococcus aureus*, *Lactobacillus spp*, *Streptococcus spp*, *Streptococcus spp*). The un-hygienic milk handling and environment, bad water and use of contaminated milking utensils (Weber and Bioich, 1986) and processing methods by the cheese makers may be responsible for contamination of cheese in these locations. This also collaborates with the report of Oliver *et al.* (2005) that if milk is produced un-hygienically and handled carelessly, it gets contaminated. Other researcher have reported similar reports of *Streptococcus thermophilus* (Mullan, 1986), *Lactobacillus delbroueckii sub species bulgaricus* (Timson *et al.*, 1982) in cheese products. The mean total bacterial plate count of cheese from Ondo was significantly ($P < 0.05$) higher than samples from Akure and Owo while there was no significant difference ($P > 0.05$) between Akure and Owo. The microbial load obtained in this study was higher than 5×10^4 bacteria per millilitre recommended by O'Connor (1993) for milk produced under hygienic conditions from healthy cows. This could be attributed to environmental effect, mode of processing and poor handling of cheese.

Conclusion

It can therefore be concluded that the nutritional and microbial qualities of cheese can be affected by location, hence proper hygiene should be maintained in areas where cheese is produced.

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Table 1: Proximate composition (%) of cheese from three locations in Ondo state.

Location	Ash	Crude protein	Lactose	Dry matter	Fat
Akure	0.34±0.09 ^c	19.98±0.20 ^a	0.39±0.01 ^{ab}	45.05±0.17	15.51±0.15 ^b
Ondo	0.76±0.09 ^a	20.99±0.20 ^a	0.42±0.01 ^a	44.59±0.17	14.42±0.15 ^b
Owo	0.70±0.09 ^b	17.84±0.20 ^b	0.32±0.01 ^b	44.81±0.17	17.62±0.15 ^a

Means with different superscripts within the same column are significantly different (P<0.05).

Table 2: Isolated Organism in Cheese from Three Different Locations in Ondo State.

Organisms	Akure	Ondo	Owo
<i>Micrococcus luteus</i>	+	+	-
<i>Staphylococcus aureus</i>	+	+	+
<i>Lactobacillus spp.</i>	+	+	+
<i>Streptococcus spp.</i>	+	+	+
<i>Serratia marcescens</i>	+	-	+

+ = present, - = absent

Table 3: Microbial colony count of bacterial ($\times 10^{-4}$ cfu/ml) from cheese samples from three different locations.

Location	Colony Count
Akure	31.75±8.16 ^b
Ondo	128.24±8.16 ^a
Owo	25.25±8.16 ^b

Means with the same superscripts along the same column are not significantly different (P>0.05).