Microbiological Properties and Sensory Characteristics of White Cheese (Gibna bayda) Collected in Zalingei Area, West Darfur State

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Abstract: Twenty-four white cheese (Gibna Bayda) samples were collected from eight local cheese producers from Zalingei area in West Darfur state. Microbiological analysis and sensory characteristics of the cheese samples were made. The micro flora was dominated by lactic acid bacteria (LAB) with evident mould and yeast growth. The average microbiological properties were: 9.71 log cfu/ml for total bacterial count; 3.28 log MPN/ml coliforms; 0.70 log MPN/ml E. coli; 1.73 log cfu/ml Staphylococcus aureus; 5.06 log cfu/ml lactic acid bacteria; 3.72 log cfu/ml streptococci and 4.46 log cfu/ml for yeast and mould counts. However, Salmonella spp. and Clostridia spp. were not detected in all the collected cheese samples. Significant (p<0.05) variations were found between color and texture. The flavor scores of cheese samples and saltiness were significantly different (p<0.01 and p<0.001, respectively).

Keywords: White cheese, Gibna Bayda, TBC, coliform, LAB, S. aureus, E. coli counts, sensory characteristics evaluation, West Darfur, Sudan.

INTRODUCTION

In Sudan, milk mainly produced on village farms and rural areas. Livestock farming in general and milk products in particular still play an important socio-economic role in developing countries[9]. Cheese provides a useful service in extending the shelf life of a valuable human foodstuff-milk.[1] Gibna Bayda is a pickled type of cheese that is stored in airtight containers filled with salted whey[10]. It is a soft pickled ripened cheese adopted in Sudan, manufactured from raw or pasteurized milk[10]. The cheese is white colored and a close texture, generally consumed fresh or matured for a period of several months[2]. White cheese production based mainly in small modern dairies and family plants which often resulted in different compositions and poor hygienic quality[4].

Positive isolates for Salmonella typhi, Salmonella paratyphi Staphylococcus aureus and E.coli were isolated from Sudanese white cheese[20]. High numbers of coliforms and Eschericia coli, extremely high numbers of faecal streptococci and low numbers of Staphylococcus aureus[24]. These authors added that, Salmonella spp. Clostridium perfringens were not present from the cheese samples. Some yeast species capable of causing a bitter taste, putrefaction and gas formation in Turkish White cheese were identified[20].

In spite of its popularity, there were few studies on the characteristics of this cheese manufactured in west Sudan. The aim of the study was to evaluate the microbiological and sensory characteristics of the Gibna Bayda samples in Zalingei area West Darfur, Sudan.

MATERIALS AND METHODS

Source of Cheese Samples: Twenty-four samples of white cheese (Gibna Bayda) were collected from Zalingei area West Drfur, Sudan. The survey involved eight local cheese producers. Three samples were taken from each producer.

Analyses of Cheese Samples: The cheese samples were transferred in clean sterile wide mouth jars and transported at 4°C to the Regional Veterinary Laboratory, Nyala, for Microbiological and sensory evaluations.

Microbiological Analysis: Appropriate dilutions of homogenized samples were made by transferring 11 g in 99 ml of aqueous solution of 2 % sodium citrate. The contents incubated in plate count agar for total bacterial count according to FDA[10], MacConkey broth and Brilliant green lactose bile broth for coliforms and
E. coli counts, respectively, according to Thatcher and Clark[23]. Mannitol salt agar was used for Staphylococcus aureus count[18]. Double layer acetate agar was used for lactic acid bacteria, Edward agar medium for streptococci count and saboraud dextrose agar for yeast and mould counts[12]. Reinforced clostridium medium (RCM) was used according to FAD[10] and deoxycholate citrate agar (DCA) was used for the detection of Salmonella according to Thatcher and Clark[23].

**Sensory Evaluation:** Sensory characteristics were determined by 10 untrained panelists for judging the quality of the cheese in terms of color, flavor, texture and saltiness.

**Statistical Analysis:** The results were analyzed using SPSS statistical software. Complete Randomized Design was used to determine the statistical significance of differences of microbiological properties and sensory characteristics of the Gibna Bayda.

**RESULTS AND DISCUSSIONS**

**Microbial Contents of the Cheese Samples:** The average total bacterial counts (TBC) of the cheese samples was 9.71 log cfu/ml (Table 1). The TBC count ranged from 8.56 to 10.53 log cfu/ml for the cheese samples. Statistical analysis showed that there were non significant differences in TBC of different cheese samples.

Coliform counts of cheese samples ranged between 2.22 to 5.11 log MPN/ml the coliform average was 3.28 log MPN/ml. Nonsignificant differences were found between cheese samples.

The average E. coli count of the cheese samples was 0.70 log MPN/ml. E. coli was detected. The E. coli count of samples ranged from 0.00 to 2.11 log MPN/ml. Nonsignificant differences were found in E. coli counts of the different cheese samples.

The average Staphylococcus aureus count was 1.73 log cfu/ml (Table 1). However, there were five cheese samples showed no growth of the organism.

The average lactic acid bacteria count was 5.06 log cfu/ml. The lowest LAB count was 2.25 log cfu/ml, while the highest was 6.95 log cfu/ml. Significant (p<0.01) differences were found in counts from different cheese producers.

Streptococci were detected in 8 samples (Table 1). The average count was 3.72 log cfu/ml. The lowest count was 0 log cfu/ml while the highest count was 5.85 log cfu/ml.

Yeasts and moulds counts were detected in 21 samples (40%) out of 24 samples (Table 1). The average count was 4.46 log cfu/ml. The lowest yeasts and moulds count was 0 log cfu/ml While the highest count was 6.53 log cfu/ml.

Salmonellae and Clostridia organisms were not found in all cheese samples.

**Sensory Evaluations of Cheese Samples:** Results in Table 2 illustrated the sensory evaluation scores of the cheese samples from Zalingei area. Significant (p<0.05) variations were found between color and texture. Moreover, the flavor scores of cheese samples and saltiness were significantly different (p<0.01 and p<0.001, respectively).

**Discussion:** Private sector is the main activity of the cheese production in Zalingei area. The main source of milk for cheese is the fresh cow’s milk probably due to large numbers of cattle populations (Baggara type) in the area. The majority of the cheese producers in western Sudan were found in Zalingei because the business was introduced in the colonial era (Personal contact).

The results in this study showed that the average TBC was 9.71 log cfu/ml. These findings were consistent with the results of Ahmed[3] and Warsama et al.[26]. The high total bacterial count in this study might be due to low quality of the milk used in cheese making or could be due to unsanitary conditions during processing and handling of the cheese[27].

The average coliform counts of the samples was 3.28 log MPN/ml. Similar results were reported by Turantas et al.[24]; Hayaloglu et al.[13]. The results did not agree with those reported by Ahmed[3]. The high coliform counts in the cheese samples were probably due to production of milk and cheese under poor conditions[8,26]. According to international standards white cheese should not contain more than 100 cfu/ml coliforms bacteria[27].

Variations were observed in E. coli counts of cheese in different areas which could be related to the stage of ripening and production of cheese under unhygienic conditions. The results were not agreed with those stated by Turkoglu et al.[24] and Turantas et al.[24].

The average Staphylococcus aureus count was 1.73 log cfu/ml (Table 1). These findings were not in line with those reported by Ahmed[3], however, they supported Warsama, et al.[26] and Turantas et al.[24]. The high count of Staphylococcus aureus found in some cheese samples might be attributed to the high initial numbers of S. aureus in milk contamination during processing[26].
disagreed with Warsama et al. [15]. The variation in flavour scores of the cheese samples was 3.72 log CFU/ml. The results were lower than those reported by Ahmed [10] who stated that yeast population greater than 6 log CFU/ml were found in 54% out of 85 samples examined.

Salmonella and Clostridia organisms were not found in all cheese samples. This result agreed with Turantas et al. [24] However, the Salmonella results disagreed with Warsama et al. [20].

The yeast and moulds counts in this study were lower than those reported by Roostita and Fleet [21] who stated that yeast population greater than 6 log CFU/ml were found in 54% out of 85 samples examined.

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<th>Table 1: Microbiological contents (log CFU/ml) of the cheese samples from Zalingei area West Darfur state</th>
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Mean values bearing different superscripts within the columns are significantly different (P < 0.05).

Lactic acid bacteria are essential for fermentation and are acceptable in very large numbers mainly in natural cheese [15]. The average lactic acid bacterial counts in this study was lower than those reported by Ahmed [10].

The average streptococcal count in the collected cheese samples was 3.72 log CFU/ml. The results were lower than those reported by Ahmed [10] who stated that the streptococcal count in white cheese samples collected in Khartoum State was 4.50 log CFU/ml.

Salmonellae and Clostridia organisms were not found in all cheese samples. This result agreed with Turantas et al. [24]. However, the Salmonella results disagreed with Warsama et al. [20].

The average lactic acid bacterial counts in this study agreed with the collected in Khartoum State was 4.50 log CFU/ml.

Salmonella and Clostridia organisms were not found in all cheese samples. This result agreed with Turantas et al. [24]. However, the Salmonella results disagreed with Warsama et al. [20].
could be attributed to the different milk sources and to the age of the cheese.

The texture of the collected cheese samples vary from soft with close texture to slightly soft with some gas holes. Cheese samples had slightly soft texture with gas holes and less firm body, probably due to presence of coliforms and yeasts as shown in Table 2. This supported AOAD\textsuperscript{[5]} and Besancon et al.\textsuperscript{[6]}. Variations were observed in saltiness of the collected cheese samples from different producers. The results were in accordance with those reported by Alla Gabo\textsuperscript{[6]}, Ibrahim\textsuperscript{[10]} and Hamid et al.\textsuperscript{[11]}. These was probably due to different salt concentration.

**Conclusion:** From the results of this study, the presence of pathogenic organisms rise concerns about the safty of this traditional cheese. Hence we recommend, sanitation and handling of equipments and utensils, water supply in addition to the use of pasteurized milk and the application of good manufacturing practice, could increase the shelf life of Gibna Bayda and makes it safer for human consumption.

**REFERENCES**