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SHORT NOTE

Processing and evaluation of white and ricotta cheeses produced from goat milk in the Gezira State, Sudan

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The demand for dairy products increased substantially in the Sudan due to improved living standards and increased urban population. However, imports of dairy products increased since domestic production is not sufficient. White cheese is the main cheese in the Sudan and the demand for exotic cheeses increased due to increased numbers of foreigners, changes in food and improved living standards. White cheese contains 47.8% total solids, 14.0% fat, 15.9% protein and 6.2% ash (Warsama *et al*., 2006).Cheese is imported at high costs and it is important to produce it locally to reduce cost.

Goat milk is important in the Sudan due to high goat population and high nutritive and medicinal values. It contains 2.9-3.8% CP, 2.8-5.9% BF, 4.1-4.9% lactose and 11.5-13.6% total solids and a good source of amino acids and vitamins (Bernacka, 2011). The high goat milk digestibility and absorption are mainly associated with whey proteins (0.6-0.7% of milk) which are mainly albumins. Many types of cheese are produced from goat milk and are generally more valuable than cow's milk cheeses. They can be produced locally for local consumption and exported to improve the national income. Ricotta is an Italian soft cheese produced from cheese

whey (Kosikowski, 1982) and is a secondary product in cheese processing (Acciaioli *et al.,* 2009). It is probably the oldest and best known whey cheese (Pizzilo *et al.*, 2005) and is mainly produced from goat or sheep milk or their mixtures (Mucchetti *et al.*, 2002). Ricotta production after white cheese processing exploits the whey to produce extra cheese and hence increases total yield and income.

Preliminary studies at the Goat Research Centre, University of Gezira,Sudan, showed that the two types of cheese were accepted by Sudanese consumers. There is no available information on the processing and characteristics of ricotta cheese in the Sudan. Consequently, this study was conducted to produce and evaluate white cheese and ricotta cheese from pasteurized and unpasteurized goat's milk.

This experiment was conducted in the premises of the Goat Research Center, Faculty of Agricultural Sciences, University of Gezira, Wad Medani, Sudan in 2010. Twenty nine kilograms of goat milk were bought from Um Asaba village in El Housh Locality and the village is about 15 km south of Wad Medani,Sudan. The goats were well fed and managed. The milk was transported by car to the Centre in the morning and immediately used for cheese processing. The milk was filtered to exclude contaminates and then divided into two equal parts. One part was pasteurized at 70 ºC for 30 min using a water bath and the other part was not pasteurized. The milk was then used to produce the white cheese by adding rennet powder (0.22g/ kg milk) to the milk at 38 ºC and was stirred for 5 minutes and left to develop the curd as described by Osman (1987). After 45 minutes the curd was cut into small cubes and left for 5 minutes to separate the whey from the curd and then transferred into clean plastic moulds with small pores to facilitate whey drainage. The curd was left at room temperature for the next day and then

weighed and salted (6%). The whey was collected, weighed and used for ricotta processing as described by Pizzilo *et al*. (2005). The whey was heated to 90 ºC to separate the whey proteins and fresh milk was added to increase the yield. The floating curd was removed, transferred into a clean cloth, put in plastic moulds and left at room temperature. In the following day ricotta was weighed and salted.

Analytical procedures

Samples of fresh milk and cheeses were analysed for moisture, crude protein (CP) and butter fat (BF) according to AOAC (1984). Table 1 shows the chemical composition of goat milk, white and ricotta cheeses produced from goat milk . Goat milk had low CP and BF than Nubian goats in Kenana Sugar Company, Sudan (Khalifa, 2002). It also had lower moisture and CP and higher BF than Nubian goats in the Sudan (Elnaim, 1979). These variations in milk composition could be genetic, nutritional or managerial (Claps *et al.,* 2003). Pasteurization slightly increased milk CP and BF and reduced moisture. Pasteurized milk had higher CP and BF in the two types of cheese. This could be mainly because pasteurization slightly reduced moisture content. The increased BF by pasteurization is advantageous for cheese flavor and texture (Delacroix and Lambert, 2000). The results showed that milk pasteurization was beneficial for cheese processing and should be encouraged among producers.

Pasteurization of milk increased ricotta cheese CP and BF and decreased moisture. Ricotta cheese had higher moisture and CP and lower BF than white cheese. This was in line with the results reported by Hough *et al.*(1999).

Table 2 shows the yields of white and ricotta cheeses produced from goat's milk. Pasteurized milk produced higher white cheese and whey weight and percentage than unpasteurized milk.This was mainly because pasteurization slightly increased milk CP and BF and reduced moisture. Uunpasteurized milk produced higher ricotta weight and percentages of milk and whey. This was because ricotta had high moisture content and unpasteurized milk also had higher moisture content.

In conclusion, pasteurization had positive effects on milk and cheese composition and yield. In addition, ricotta processing improved cheese weight and composition.

Table 1. Chemical composition of goat milk, white cheese and ricotta produced from goat milk in the Gezira State, Sudan.

Parameters	Unpasteurized Milk(%)	Pasteurized
Milk:		
Moisture	86.40	86.20
Crude protein	3.20	3.40
Butter fat	3.80	4.00
White cheese:		
Moisture	55.40	55.00
Crude protein	14.10	14.20
Butter fat	22.10	22.30
Ricotta:		
Moisture	62.40	60.40
Crude protein	14.80	15.00
Butter fat	21.60	22.00

Table 2. Yields of white and ricotta cheeses from goat milk in the Gezira State, Sudan.

Parameters	Unpasteurized	Pasteurized
Initial milk weight (kg)	14.22	14.22
White cheese (kg)	2.54	3.29
% of milk	17.86	23.14
Whey(kg)	7.09	10.58
Ricotta (kg)	0.56	0.44
% of whey	7.90	4.16
% of milk	3.94	3.09

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تصنيع وتقييم الجبن الأبيض وجبن الريكوتا المنتج من لبن الماعز في ولاية الجزيرة بالسودان

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الخلاصة

أجريت دراسة لإنتاج وتقييم الجبن الأبيض والريكوتا المصنعة من لبن الماعز (86.4% رطوبة ، 3.2% بروتين خام و 3.8% دسم) المبستر أو غير المبستر. خلط شرش اللبن مع لبن طازج واستخدم لإنتاج الريكوتا. أنتج اللبن المبستر جبناً وشرش لبن أكثر من اللبن غير المبستر والذي أنتج ريكوتا أكثر. كانت إنتاجية الجبن الأبيض 2.54 و3.29 (كجم) للبن غير المبستر وللبن المبستر على التوالي. كانت النسب المئوية لوزن الجبن الأبيض لوزن اللبن 17.86% و 23.14%على التوالي . كان وزن الشرش (كجم) 7.09و 10.58 للبن غير المبستر وللبن المبستر على التوالي . كانت إنتاجية الريكوتا 0.56 و 0.44 (كجم) للبن غير المبستر وللبن المبستر على التوالي . كانت النسبة المئوية لوزن جبن الريكوتا الى وزن اللبن 3.94% و 3.09% على التوالي . وكانت نسب وزن الريكوتا الى وزن الشرش 7.9 و4.16 للبن غير المبستر وللبن المبستر على التوالي. زادت البسترة البروتين الخام والدسم في اللبن وفي نوعي الجبن. وكانت نسب الرطوبة أعلى في اللبن ونوعي الجبن عند عدم البسترة. أنتج اللبن المبستر جبناً أبيضاً وريكوتا أعلى بروتيناً ودسماً من اللبن غير المبستر. بينت الدراسة فوائد البسترة على اللبن وتركيب الجبن وإنتاجية الجبن الأبيض كما أن الريكوتا حسنت إنتاجية ونوعية الجبن