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Short Communication

The Free Amino Acid Composition of The Sudanese Fermented Camel's Milk (Garris)

Abdallah A. Alyan[1] , Abdel Moneim E. Sulieman[2] and ElaminA. Elkhalifa[2]

[1]Department of Food Processing , Faculty of Engineering, El-Imam El-Mahadi, Kosti, Sudan.

[2] Department of Food Science and Technology2, Faculty of Engineering and Technology, University of Gezira, Wad-Medani, Sudan

INTRODUCTION

Many workers have investigated the composition of milk and milk proteins of various species of domestic animals but the information regarding the composition of fermented camel 's milk is still limited. The fresh camel milk contains 3.3-4.7% protein, 2.8 - 3.6% fat, 4.0 - 5.2% lactose, 0.7% ash, 9.2 - 15.4% total solids, and to has a pH of 6.0-6.5 (Abdel Rahim, 1987). The casein of camel milk is richer in proline and threonine than cow's milk, but poorer in alanine, arginine, glycine and serine (Hoeller and Hassan, 1965).

From the few available data on camel milk casein micelles, it appears that amino acid composition is generally similar to that of cow's milk protein. However, camel's milk casein differs from cow's milk casein in terms of molecular size distributions. Y agil (1987) confirmed the observation that the amino acid content of camel's milk differs from that of other ruminants; the alanine and histidine content is lower than those of cow and goat milk, aspartic and glutamic acids are present in the same percentages as in cow milk which is lower than in goat milk, isoleucine and leucine are present in higher percentages in camel 's milk than in milk of other ruminants.

Mehaia and A1-kahal (1992) found that the free amino acids content in camel's milk were as follows: tyrosine 1.3, aspartic acid 0.7, proline 0.4, alanine 10.8, glutamic acid 13.1, glutamine 3.8, valine 1.6, isoleucine 0.9, leucine 0.5 and arginine 0.7 ug/100 ml. Glutamic acid was the most abundant free amino acid in the milk of camel, cow and man. In general, of all species studied, human milk had the highest concentration of total free amino acids, while the cow and camel milk has the lowest concentration. The aim of the present study was to determine the concentration of total free amino acid content in Garris (Sudanese

traditionally fermented camel's milk) using High Performance Liquid Chromatography (HPLC).

MATERIALS AND METHODS

Preparation of samples

Traditional Gariss samples were obtained from different locations in Kordofan "Western Sudan" and Butana "Eastern Sudan" areas, during the period (March - June , 2008), three samples for each location. Each sample was transferred to 250 ml autoclavable plastic container. Those containers were previously sterilized at 121 ^{0}C for 15 min. then cooled. All collected sampleswere then placed in an insulated box contaning ice crystals to suppress microbial growth during transportation to the laborotary. The samples were kept at 4 0 C and transported to the Food Technology Research Institute in Egypt.

Methods of analysis

The free amino acid composition of experimental samples was determined using HPLC-Pico-Tag method according to Cohen et al. (1989). The amino acids were quantified by comparison of peak area with those corresponding amino acids standard solutions using the Spectra Physics Data System Program.

Acid hydrolysis

A sample corresponding to one mg protein were weighed into 25x150 mm hydrolyzed tube, an aliquot (7.50 ml) of 6 N HCI was added, purged with nitrogen for 60 seconds and tube was capped immediately. The tube was placed inl 100 C oven for 24 hours, removed and allowed to cool. The contents of the tube were quantitatively transferred to 25 ml volumetric flask and completed to volume with HPLC grade water.About 1 ml of the solution was filtered through 0.45 m Millipore membrane filter.

Amino acid derivatization

Ten ml of the filtered sample in 6 x50 mm tube were placed into a drying vial and dried in a freez-dryer workstation for10-15 min. An aliquot (30 µ1) of redry solution (consists of a mixture of 200 µ l methanol, 200 µ l N sodium cetate and 100 µ l triethylamine was added to the sample tu es and redried again in the workstation.

Aliquot (30 µ l) of the freshly prepared derivatization reagent (performed by mixing 350 µ l, methanol, 50 µ l (PITC) phenylisothio - cyanate) was added to the tube contents and allowed to react for 20 min. and then dried in the workstation for 15 min.

Thirty microliters methanol were added and re-dried again, 250 µ l of sample diligent (Waters,USA) were added to the dried tube, vortexed and transferred to injection vials. The standard amino acid (Sigma, USA) solution was treated in the same way as the sample.

RESULTS AND DISCUSSION

Table (l) presents the total amino acid content of Garris obtained from Kordofan and Butana areas.All samples contained appreciable amounts of the essential amino acids (histidine and isoleucine) and the non-essential amino acids (serine, glycine, cystine and aspartic acid). The content of histidine was 0.06% and 0.04% in Kordufan and Butana Gariss, respectively. This concentration is lower than that reported by Sulieman (2001), who reported a value of 0.12% in traditional rob (fermented sour milk product prepared from cow or goat's milk in Sudan). Thereonine constituted 0.20% and 0.07% in Kordofan and Butana Gariss, respectively. These values were also lower than those of rob product which contained 1.8% and 0.22% in traditional and lab-made rob (Sulieman, 2001). As for the concentration of valine, it was greater in comparison to that of rob which was only 0.5% as reported by Sulieman (2001).

Table(l): Amino acids content of fermented camel milk (Gariss) from Kordofan and Butana areas in Sudan

Amino acids	Kordofan	Butana
Histidine	0.06	0.04
Threonine	0.20	0.07
Valine	0.14	0.09
Methionine	0.09	0.13
Leucme	0.20	0.05
Isoleucine	0.08	0.05
Tyrosine	0.16	0.17
Phenylalanine	0.28	0.17
Lysine	0.10	0.03
Total	1.13	0.88
	Non-Essential amino acids %	
Arginine	0.16	0.11
Alanine	0.27	0.33
Serine	0.03	0.03
Glycine	0.06	0.06
Praline	0.14	0.04
Cystine	0.06	0.03
Aspartic acid	0.05	0.80
Glutamic acid	0.34	0.24
Total	1.11	1.64

Results are average of 3 replicates.

Glutamic, phenylalanine and alanine were the most abundant free amino acids in Kordufan Gariss, however, aspartic, alanine

and glutamic acid, were the most abundant free amino acids in Butana Gariss. Yagil (1987) confirmed the observation that Amino acid content of camel milk differs from that of other ruminants, alanine and histidine content being lower than that of cow and goat milk. Aspartic and glutamic acid are present in the same percentages as in cow milk which is lower than in goat milk. Leucine and phenylanine are present in higher percentages in camel milk than in milk of other ruminants.

The determined amino acids may have a role in the development of Gariss flavour. The ability to enhance the release of specific free amino acids would facilitate analysis of their potential sensory effects. The increase in free amino acids content in Gariss compared to those of milk is not surprising since many investigators reported increases in free amino acids of dairy products as a result of fermentation such as Aim (1982) who reported that, as a result of bacterial proteolysis during fermentation, yoghurt has higher levels of free amino acids compared to milk.

Aruna and Khem (1978) stated that the degradation of proteins contributes to softening of the cheese, thereby altering texture. Proteins are degraded by microbial protease to yield peptides andamino acids. These amino acids can undergo a variety of changes

such as side-chain alteration, decarboxylation, transamination and oxidative deamination to u- keto acids. Additionally, the amino acids can enter into non-enzymatic browning reaction withsugars to yield flavour compounds.

REFERENCES

Abdel Rahim, A. G. (1987). The chemical composition and nutritional value of camel and goats milk. World Review of Animal Production 23 (1):9-12.

Aim, L. (1982). Effect of fermentation of lactose, glucose and galactose content in milk and suitability of fermented milk products for lactose intolerant individuals. Journal of Dairy Science. 65. 346-352.

Aruna, K. and Khem, M.S. (1978). Lactic fermentation's of dairy foods and their biological significance. Journal of Dairy Science 4(1): 34-39.

Cohen, s.A., Newyes, M. and Travin, T.L. (1989). The Pico Tag method. In "A Manual of Advanced Techniques for Amino Acid analysis", Millipore, U.S .A

Hoeller, H. and Hassan, Y.M. (1965). The amino acid composition of camel milk casein. Sudan Journal of Veterinary Science and Animal Husbandry 6(2): 60-63.

Mehaia, M.A. and A1-Kahal, M.A. (1992). Taurine and other free amino acids in camel, buffalo and ass milk. Milchwisse-nschaft. 45 (l): 113-115.

Sulieman, A.E (2001). Chemical, biochemical and microbiological studies on the Sudanese traditionally fermented Milk (Rob) Ph.D. thesis, University of Gezira, Sudan.

Yagil, R. (1987). Camel milk, a review. International Journal of Animal Science. 3(2): 81-99.