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Evaluation of some Biochemical Constituents of Human's milk and Goat's milk to compare between them

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Abstract

To Comparison in some biochemical constituents between human and goat milk carried out this study. 20 milk samples were collected: 10 samples from human milk and 10 samples from goat milk. The biochemical constituents was analyzed in this study included (fat, protein, lactose, solids non fat (SNF), milk density, freezing point (FP), and conductivity (Z). There was no significant difference in fat, sold non fat (SNF), density, protein, and lactose content between human's milk and goat's milk. While, there was a significant difference in FP and Z. The human's milk has a high freezing point (FP) and conductivity (Z) than in goat's milk. In human's milk, the fat associated positively non-significantly correlation with SNF, FP, and conductivity (Z). While, the correlation was non-significantly negative between fat with density, protein, and lactose. A significant positive correlation was found between SNF with the density, FP, lactose, and between density and protein with FP and lactose, as well as FP showed a significant positive correlation with lactose. While, the conductivity (Z) associated a significant negative correlation with the density and freezing point. In goat's milk, The results showed a non-significant positive correlation between fat with SNF, protein, FP, and lactose, while, it's correlation was non-significantly negative with density and conductivity (Z). The SNF showed a significant positive associated with density, protein, FP, lactose and between density with protein and lactose, and also between FP and lactose. Protein has a significant positive association with FP and lactose.

Introduction

Human's milk is essential source of nutrition and calories for infants and children. It is recommended as the optimal food for the first 6 months of life, with continued breastfeeding with appropriate complementary foods for up to two years (Heinig, 1998; Gartner *et al.*, 2005). It contains a wide variety of nutrients either as proteins, lipids, carbohydrates and other biologically active components (Andreas *et al.*, 2015). Breast's milk also contains important non-nutritional components, such as gastro- intestinal hormones, peptides, oligosaccharides, nucleotides, growth factors and cellular components that are important for passive protection against infections and immune-mediated diseases and modulate immunological development (Picciano, 2001; Hanson *et al.*, 2003; Fanaro & Vigi, 2012).

Goat's milk similar to human's milk than cow's milk, and it contains

complex proteins, fatty acids contains vitamins, enzymes, minerals, trace elements and electrolytes that are more digested by the body. (Kumar *et al.*, 2012). In addition to its significant nutritional functions, goat's milk has therapeutic functions in abnormal or disease conditions of human nutrition and health, thus goat's milk has been recommended as an best substitute form bovine milk, especially for those who suffer from cow's milk allergy (Mereado, 1982; and Kumar *et al.*, 2012).Therefore, the present study was conducted to assessment the differences in some of biochemical constituents between human's milk and goat's milk.

Methods

The milk samples number included in this research was 20: 10 samples of human's milk and 10 samples of goat's milk, where 5 ml pulled of human's milk and goat's milk during morning. The parameters in this work examined by Eko Milk Analyzer Ultrasonic in the laboratories of in Agriculture college/ Al Muthanna university. The method of measurement followed the way of AL-Humesh and Alugaidi (2012).

Statistical analysis

For statistical testing of quantitative data used the statistical package of social system/ 20. The mean and standard error and the correlation coefficient were tested for all parameters. The ANOVA was analyzed for each parameter in this study. The significant differences between the parameters tested by F test at the level of probability ($P<0.05$) and ($P<0.01$) (Oqaili & Samer, 1998).

Results and Discussion:

The levels of biochemical composition (fat (%), protein (%), lactose (%), solids non fat (SNF) (%), milk density (g/cm3), freezing point (°C), and conductivity (Z) (mS/cm)) in milk of human and goat were represented in figure1.

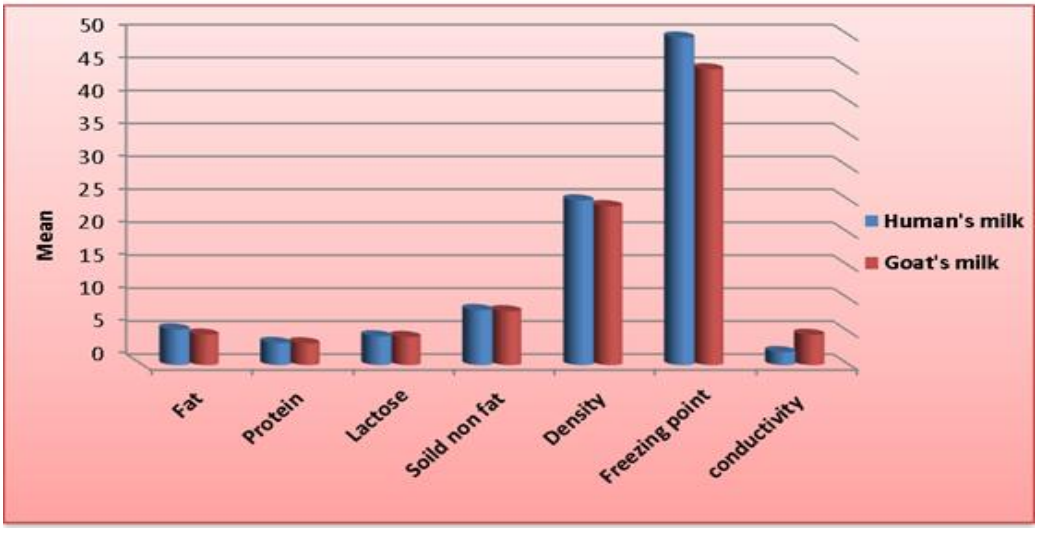

Figure (1): the mean of parameters of Human and Goat milk

The fat

The results showed no significant difference between fat content of

human's milk (5.11± 1.00) compare with fat content of goat's milk (4.61± 0.74).

The fat content of goat's milk is in agreement with the findings of Ranawana and Kellaway (1977). In our study, the fat content of goat's milk is higher than that mentioned by (Ali and Hassan, (1988); Keskin *et al.,* (2004); Mahmood and Usman , (2010); Taher *et al.,* (2011); Sabahelkhier *et al.*,(2012); and Jasim *et al.,* (2013).

The fat content of human's milk is higher than that mentioned by with the findings of (Sabahelkhier *et al.,* (2012); Al-Humesh and Aqidi, (2012).

The protein

The findings showed there was no significant differences between protein content in milk of human (3.35± 0.33) compare with protein content in milk of goat (mean± SE 3.29± 0.58).

The protein content of goat's milk is in consistent with the findings that mentioned by Sabahelkhier *et al.,* (2012).

The protein content of goat's milk is lower than that mentioned by (Mahmood and Usman, (2010) ; Taher *et al.,* (2011); Jasim *et al.,* (2013).

While the protein content of human's milk is higher that protein content that reported by Sabahelkhier *et al.,* (2012), but it is lower than results reported by Al-Humesh and Aqidi, (2012).

lactose

The result of lactose content indicated no significant differences between lactose content in human's milk (4.36± 0.16) compare with its content in goat's milk (4.26± 0.07).

The lactose content of goat's milk is in agreement with the findings of Taher *et al.,* (2011).

The findings of this study are lower than findings of previous studies that reported by (Sabahelkhier *et al.,*(2012); Jasim *et al.,* (2013).

The lactose content of human's milk is in agreement with the values mentioned by Al humaish and Aqidi, (2012), but the lactose content of human's milk is lower than results reported by Sabahelkhier *et al.,* (2012).

The solids non fat (SNF)

From figure (1) indicated that there was non-significant differences in the solids non fat (SNF) content in milk of human content (8.34± 0.46) comparing with solids non fat (SNF) content in milk of goat (8.17± 0.71).

The solids non fat (SNF) content in goat's milk of this study is lower than previous studies mentioned by(kanwal *et al.,*(2004); Taher *et al.,* (2011); and Jasim *et al.,*(2013).

The solids non fat (SNF) content of human's milk is lower than values reported by Al-Humesh and Aqidi, (2012).

The milk density

The comparison was non-significant between milk density in human's milk (24.98± 2.09) and milk density in goat's milk (24.11± 2.72).

Milk density of goat's milk was lower than results reported by Taher *et al.,* (2011).

While milk density of human's milk is lower than values mentioned by Al humaish and Aqidi, (2012).

The freezing point (FP)

Figure (1) showed a significant increase at (P<0.05) in freezing point of human's milk (49.69± 2.91) compare with its content in goat's milk (44.88± 4.56).

The different values of freezing point in this study may be due to it influenced by a number of factors: breed, stage and order of lactation, nutritional deficiencies, water intake, weather conditions, thermal stress, seasonal influences, and presence of CO_2 in milk (Wiedemann *et al.,* (1993); Antunac *et al.*,(2001).

The freezing point (FP) content of goat's milk was higher than values given by Taher *et al.,* (2011).While The freezing point (FP) content of human's milk is higher than those results given by Al humaish and Aqidi, (2012).

The conductivity (Z):

The conductivity of goats' milk (4.58± 0.45) increased significantly at (P<0.01) compare with human's milk (1.96± 0.18)

The conductivity of goat's milk is lower than those values given by Taher *et al.,* (2011). The conductivity of human's milk is lower than those values reported by Al-Humesh and Aqidi, (2012).

The conductivity in milk due to there are many of different electrolytes (Imran *et a l.,* (2008). The high level of conductivity of goat's milk in this study may be to high levels of electrolytes found in milk samples.

The correlation among human's milk components

The relationship among biochemical composition (fat, protein, lactose, solids non fat (SNF), milk density, and freezing point) in human's milk were represented in table 1.

Table (1): The correlation among human's milk components

	Fat	SNF	DEN	PROT	FP	LAC	Z
Fat	1						
SNF	.025	1					
DEN	-.445	.871**	1				
PROT	-.191	.457	.562	1			
FP	.128	.849**	.764*	.679*	1		
LAC	-.308	.689*	.789*	.899**	.747*	1	
Z	.135	-.635	-.717*	-.454	.771*	-.442	1

* (P<0.05)
** (P<0.01)

The results showed there were a non-significantly positively correlation between the fat and SNF, FP, and conductivity Z, while the correlation was negative between the fat and density, protein, and lactose.

SNF showed significantly positive correlation with density, FP, and lactose at 0.01 and 0.05 respectively, and its correlation was non significantly positively with protein and non significantly negatively with conductivity.

The relationship between lactose and conductivity was negative correlation at 0.05. This correlation was non-significant.

The density associated positively non-significantly with protein and significantly positive with FP and lactose at 0.05. The density associated inversely significantly with conductivity at 0.05.

The protein showed significantly positive association with FP and lactose at 0.05 and 0.01 respectively while its correlation with conductivity was non significantly negativity. FP associated significantly positively with lactose and conductivity at 0.05.

The correlation among goat milk components

The relationship among biochemical composition (fat, protein, lactose, solids non fat (SNF), milk density, and freezing point) in goat's milk were represented in table 2.

Table (2): The correlation among goat's milk components

	Fat	SNF	DEN	PROT	FP	LAC	Z
Fat	1						
SNF	.326	1					
DEN	-.158	.742*	1				
PROT	.345	1.000**	.733*	1			
FP	.455	.987**	.632	.989**	1		
LAC	.097	.972**	.812*	.967**	.928**	1	
Z	-.408	.262	.444	.249	.180	.384	1

* (P< 0.05)
** (P< 0.01)

The correlation between fat with SNF, protein , FP, and lactose were positive but this correlation was non-significant, while the association between fat with conductivity and density were non-significantly negative.

The result of fat correlation with SNF, protein , and lactose are consistent with other studies that mentioned by (Zeng *et al.*, (1997); Malau-Aduli *et al.*, (2002); Taher *et al.*, (2011); and Zaharia *et al.*, (2011), and its correlation with density is inconsistent with result that reported by Ueda, (1999). The correlation of fat with conductivity is consistent with result that mentioned by Deiad *et al.*, (2010).

The SNF showed a significantly positive association with density at 0.05 and with protein, FP, and lactose at 0.01. Its correlation with conductivity was non-significantly positive.

The association of SNF with protein and lactose in this study was consistent with values that reported by Zeng *et al.*, (1997) and Taher *et al.*, (2011). The correlation of SNF with conductivity were agreement with the findings that mentioned by Deiad *et al.*, (2010). The relationship between density with protein and lactose were significantly positive at 0.05. While FP and conductivity showed non-significantly positive correlation with density.

The positive correlation between density and protein was compatible with findings of Ueda, (1999).

Our results revealed that the correlation between protein with FP and lactose were significantly positive at 0.01, and non-significantly positive with conductivity.

The result of association between protein and lactose in this study was consistent with previous findings that mentioned by Zeng *et al.*,(1997); Taher *et al.*, (2011); and Zaharia *et al.*, (2011). And inconsistent with the results that mentioned by Ying *et al.*, (2004). The correlation between protein and conductivity was incompatible with findings that reported by Deiad *et al.*, (2010).

The statistical analysis showed that the correlation between FP and lactose were significantly positive at 0.01, and non-significantly positive with conductivity.

Lactose showed non-significantly positive correlation with conductivity, and this result in this study was inconsistent with result mentioned by Deiad *et al.*, (2010).

Conclusions:

The freezing point (FP) and conductivity (Z) were higher in human's milk than in goat's milk

- In human's milk, SNF increased with increasing of the density, FP, and lactose, also, density and protein increased with increasing FP and lactose. The rising in lactose content leads to an increase in FP. While conductivity (Z) decreased with increasing density and FP..
- In goat's milk, SNF increased with increasing of the density, protein, and FP, and lactose. Rising in protein and lactose contents leads to increasing in density. FP increased with increasing the lactose, also, protein increased with increasing in content of FP and lactose.

References

- Al-Humesh, M. J. M .and Alugaidi , R. I.k.(2012). The Study of Chemical and Physical properities of Milk In The Suckling Women. *Tikrit Journal of Pure Science*.17(3): 89- 97.
- Ali, M.Y. and Hassan, A. K. (1988). Physical and chemical properties of goat milk. *Mesopotamia J. Agric*. 20: 213-219.
- Andreas, N. J.; Kampmann, B. and Mehring Le-Doare, K. (2015). Human breast milk: A review on its composition and bioactivity. *PubMed*. Retrieved 5 November 2015.

- Antunac, N.; Havranek, J. and Samarija, D. (2001): Freezing point of goat's milk. *Milchwissenschaft*. 56, 14–16.
- Deiad, O.; Sh. Kaskous and J. Skouti.(2010). Relationship between electrical conductivity and other milk production parameters of Shami goat in AL quneitera area. *J. Animal and Poultry Production, Mansoura Univ.* 1 (9): 415–424.
- Fanaro, S. and Vigi, V. (2012). Feeding the Term Infant: Human Milk and Formula, In: G. Buonocore, R. Bracci and M. Weindling, Eds., Neonatology. A Practical Approach to Neonatal Diseases: A Practical Approach to Neonatal Management, *Springer*, Milan, pp. 290-297.
- Gartner, L. M.; Morton, J.; Lawrence, R.A.; Naylor, A. J.; O'Hare, D. and Schanter, R.J. (2005). Breastfeeding and the use of human milk. *Pediatrics* 115(2): 496– 506.
- Hanson, L. A.; Korotkova, M. and Telemo, E. (2003). Breast- feeding, Infant Formulas, and the Immune System, An-nals of Allergy, Asthma and Immunology. 90 (6): 59- 63.
- Heinig, M. J. (1998). The American Academy of Pediatrics recommendations on breastfeeding and the use of human milk. *J Hum Lact*. 14 (1): 2– 3.
- Imran, M.; Khan, H.; Hassani, S. and Khani, R. (2008). Physicochemical characteristics of various milk samples available in Pakistan. *J Zhejiang Univ Sci B*. 9 (7): 546- 551.
- Jasim, M. A.; Mohammed, M. J.; and Ahmed, A. R. (2013). Study Chemical Composition and Physical Characteristics Of Cow′s milk, Sheep, goats and camels in City Tikrit/ Iraq. *Journal of Tikrit University For Agriculture Sciences*.1:1-7.
- Kanwal, R.; Toqeer, A. and Bushra, M. (2004). Comparative analysis of quality of milk collected from buffalo, cow, goat, and sheep of Apindi. 3, Islamabad region in Pakistan.
- Keskin, M.; Avflar, Y.K.; Biçer, O.; and Güler, M.B. (2004). A comparative study on the milk yield and milk composition of two different goat genotypes under the climate of the eastern Mediterranean. *Turk. J. Vet. Anim. Sci*. 28: 531- 536.
- Kumar S.; Kumar, B.; Kumar, R.; Kumar, S.; Khatkar, S. and Kanawjia, S.K. (2012). Nurtional Features of Goat Milk. A Review. *Indian. J. Dairy Sci.* 65(4).
- Mahmood, A. and Usman, S. (2010). A comparative study on the physicochemical parameters of milk samples collected from buffalo, cow, goat and sheep of Gujrat, Pakistan. *Pakistan journal of Nutrition*, 9 (12): 1192- 1197.
- Malau-aduli, A. E. O. and Anlade , Y. R. (2002).Comparative Study on Milk Compositions of Cattle, Sheep a nd Goats in Nigeria. *Animal Science Journal.*73(6): 541– 544.
- Mereado, S. S. (1982). Goat milk industry in Mexico. Proc. 3ed Intr. Conf. on Goat Production and Diseases. Scottsdale, A2. *Dairy Goat J*. Publication.
- Oqaili, S. S. I. and Samer, M. S. (1998). Statistical analysis using the SPSS program. Sunrise House Publishing and Advertising, Amman- Jordan p 420.
- Picciano, M. F. (2001). Nutrient Composition of Human Milk. *Pediatric Clinics of North America*. 48 (1): 53- 67.

- Ranawana, S. S. E. and Kellaway, R. C. (1977). Responses to postrumminal infusions of infusions of glucose and casein in lactation goats. *Brit. J. Nutrition*, 37,395.
- Sabahelkhier, M. K.; Faten, M. M.; and Omer, F.I. (2012). Comparative Determination of Biochemical Constituents between Animals (Goat, Sheep, Cow and Camel) Milk with Human Milk. *Res. J. Recent Sci.* 1, (5): 69-71.
- Taher, K. N.; Hassan, H. J. and Mohammad, B. J. A. (2011). study effect of age of dam and sex of birth on chemical and physical composition of milk in some farm animals. *Kufa Journal For Veterinary Medical Sciences*.2 (2): 8-17.
- Ueda, A. (1999). Relationship among milk density, composition, and temperature. M.Sc. thesis. The Faculty of Graduate Studies. The University of Guelph: p. 61.
- Wiedemann, M.; Buchberger, J.and Klostermeyer, H. (1993): The reasons for abnormal freezing points in raw milk Ursache für anomale Gefrierpunkte der Rohmilch. DMZ– Lebensmittelindustrie and Milchwirtschaft, 114, 634–644.
- Ying ,C.; Yang, C. and Hsu, J. (2004). Relationship of Somatic Cell Count, Physical, Chemical and Enzymatic Properties to the Bacterial Standard Plate Count in Different Breeds of Dairy Goats. *Asian-Aust. J. Anim. Sci.* 17(4): 554- 559.
- Zaharia, N.; Pascal, C.; Zaharia, R.; Sava, C. A.; Atanasiu, T. (2011). Evaluation of milk production of goats populations from north-eastern Romania. *Lucrari Stiintifice– Seria Zootehnie*, USAMV Iasi. 55: 107– 112.
- Zeng, S. S.; Escobar, E.N. and Popham, T. (1997). Daily variations in somatic cell count, composition, and production of Alpine goat milk. *Small Ruminant Research*. 26: 253-260.

تقييم بعض المكونات الكيموحيوية في حليب الإنسان وحليب الماعز من اجل المقارنة بينهما

اقبال عوض كاطع
كلية التربية للعلوم الصرفة - جامعة المثنى

الخلاصة

نفذت هذه الدراسة من اجل المقارنة في بعض المكونات الكيموحيوية بين حليب الانسان وحليب الماعز. تم جمع 20 عينة حليب: 10 عينات من حليب الانسان و10 عينات من حليب الماعز. المكونات الكيموحيوية التي قيست في هذه الدراسة شملت (الدهون، البروتين، اللاكتوز، المادة الصلبة الغير الدهنية، كثافة الحليب، نقطة الانجماد، والتوصيلة الكهربائية). لم يكن هناك اختلاف معنوي في محتوى الدهون، المادة الصلبة الغير الدهنية، الكثافة، البروتين، واللاكتوز بين حليب الأم والماعز، في حين كان هناك اختلاف معنوي في محتوى نقطة الانجماد والتوصيلة الكهربائية. حليب الام يحتوي على نسبة عالية في محتوى نقطة الانجماد والتوصيلة الكهربائية مما في حليب الماعز. في الحليب البشري، ارتبط الدهن ارتباط موجب غير معنوي مع المادة الصلبة الغير دهنية، نقطة الانجماد والتوصيلة الكهربائية. بينما كان ارتباطه غير معنوي سالب مع الكثافة، البروتين واللاكتوز. تم العثور على علاقة إيجابية معنوية بين المادة الصلبة الغير الدهنية مع الكثافة، نقطة الانجماد، واللاكتوز، وبين الكثافة والبروتينات مع نقطة التجمد واللاكتوز، وكذلك أظهرت نقطة الانجماد علاقة إيجابية معنوية مع اللاكتوز، بينما ارتبطت التوصيلة الكهربائية ارتباطا سلبيا معنويا مع نقطة الكثافة ونقطة الانجماد. في حليب الماعز، أظهرت النتائج وجود علاقة إيجابية معنوية بين المادة الصلبة الغير الدهنية مع الكثافة، والبروتين، ونقطة الانجماد، واللاكتوز، وبين كثافة مع البروتين واللاكتوز، وأيضا بين نقطة التجمد واللاكتوز. البروتين له علاقة إيجابية معنوية مع نقطة التجمد واللاكتوز.