

Characterization of some milk components, function of lactation, in buffaloes

¹Aurelia Coroian, ¹Cristian O. Coroian, ²Cristian T. Matea, ¹Vioara Mireșan,
²Antonia Odagiu, ¹Camelia Răducu, and ¹Stelian Dărăban

¹University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, Faculty of Animal Husbandry and Biotechnology, Cluj-Napoca, Romania; ²University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, Faculty of Agriculture, Cluj-Napoca, Romania. Corresponding author: A. Coroian, coroiان.aurelia@gmail.com

Abstract. This study aims to analyze the main milk components function of lactation. The following components were analyzed: fat, protein, lactose, non-lipid dry matter, density, and pH. In our study these components are influenced by the specific reference seasonal conditions. The average fat percent in milk frames within: 7.23-8.89%; protein 5.17-5.42% and lactose 4.19-4.94%.

Key Words: milk, buffalo, fat, protein.

Introduction. Under genetically and ecological considerations, the Romanian buffalo belongs to the river type, common riparian type (Mediterranean), respectively (Georgescu & Râmneanțu 1990). Due to the chemical composition, the buffalo milk has traits that facilitate the cheese manufacture (Aspilcueta-Borquis et al 2010). The buffalo is the second species as importance for dairy production, worldwide (Velea & Zanc 2010).

We also want to mention, that function of rearing area, there is valuable biological material, as buffalo bull candidate mothers, or breed family structures, some of them with varying degrees of Murrah breed blood.

The production performances obtained by the buffalo breeders from the European countries, which import buffalo females from Romania, and supply appropriate rearing and maintaining conditions, reaches more than 2,000 kg milk per lactation (Velea & Mărginean 2006). The production potential is strongly influenced by the biological material, rearing area, degree of improvement, and exploitation conditions.

Compared with the milk from other species, the buffalo milk has higher protein and fat content. The aim of this study was to analyze some constituents of the buffalo milk function of season and lactation month. The composition of the buffalo milk is influenced considerably by many factors, as lactation, lactation month, parturition day, seasonal feeding level, and diet structure. Uallah et al (2005) carried a study on buffalo mastitis and their influence on fat and protein content in milk.

Catillo et al (2002) studied the age effect on milk production in Italian water buffaloes. The buffalo milk, compared to milk of other species, is least studied yet. The buffalo milk contains all nutrients necessary for the human body. Due to these constituents it is commonly used to manufacture various types of cheese, yogurt and ice cream (Ganguli 1974).

Khan et al (2007) carried on a comparative study concerning the chemical and physical composition of milk in marsh and water buffaloes. The total fat and protein content is higher in buffalo milk compared to cow milk (Kuldip et al 2000).

The research purpose was to investigate the influence of lactation and season on the main constituents of buffalo milk.

Material and Method. Female buffaloes have been studied from an area in Sălaj county. They are reared in household type farms with 3-5 individuals. Milk samples were labeled, considering lactation. A number of 72 buffalo females within lactation I-V were studied as follows: (lactation I n=25; lactation II n=15; lactation III n=11; lactation IV n=12; lactation V n=9). The following components were analyzed: fat (%), protein (%), lactose, non-lipid dry matter (%), density (g/cm³), and pH. In order to analyze these parameters, we used the Lactoscan device.

Results and Discussions. The fat from the buffalo milk had in lactation I the highest average value of 8.89% and the smallest in lactation III, 7.23% (Table 1 and 2). These results are similar with others obtained in Romanian buffalo, and reported by Bud (1984).

Concerning the seasonal and lactation month variation, they did not significantly influence the main constituents of the buffalo milk, respectively fat, protein, and lactose. The average values recorded for lactose and protein are relatively constant by all five studied lactations. The density and pH frame were within the average values reported in literature.

The results concerning the main physical-chemical components of milk in studied buffaloes are presented in tables 1 and 2. The fat percent had different values function of lactation stage and milk production volume. Similar results were reported by Velea et al (1990) in studies upon buffaloes. Bei-Zhong et al (2007) studied the physical-chemical traits of milk from Murrah buffaloes and reported an average fat content of $6.57 \pm 1.21\%$, protein $4.27 \pm 0.43\%$, lactose $5.07 \pm 0.13\%$ and pH 6.53, and for milk from Nili Ravi breed, average fat values of $6.53 \pm 1.28\%$, protein $4.16 \pm 0.20\%$, lactose $4.56 \pm 0.10\%$ and pH of 6.39 ± 0.06 .

The buffalo milk is rich in dry matter (17.0-18.5%), and fat (7.2- 9.9%), with an average of 7.5%, protein (3.8-4.5%), lactose 4.1% and mineral salts (0.7%) (Bud 1984; Creța & Comănici 1977).

Concerning the milk production, the studied buffalo recorded an average production of 1280 kg milk, 98 kg fat and 63 kg protein. Rosati & Van Vleck (2002) reported in a study upon buffalo's a minimum of 5.15% and a maximum 13.26% fat content; a minimum of 3.13% and a maximum of 6.46% protein content. Bufano et al (2006) carried on a study upon buffaloes and reported the following average values: fat 8.22 – 9.38%; protein 4.45 – 4.84% and lactose 4.82-4.91%, these values are similar with those obtained in the present study.

Asif & Usman (2010) reported similar results with those obtained in this study for buffalo milk. According to research carried on by Pucleanu (2000) the protein percent in the milk from buffaloes maintained in mixed system was a 4.69% in average, with a variability framed in normal values (9.18%).

Similar results to those presented in Tables 1 and 2 concerning the total fat, protein, and lactose contents were reported by Kuldip et al (2000) in Murrah buffaloes.

In Egypt, Ghada & Soliman (2005) compared the chemical composition of the: human, cow, buffalo, camel and goat milk. They reported the following values for buffalo milk: 4.02% protein, 7.52% fat and 5.02% lactose.

The lowest production levels correlated with lower protein and fat percentages were obtained during the summer.

Coroian et al (2011) conducted a study of buffalo milk in three breeding areas and reported lower fat content in buffalo milk in I and VI lactation comparing with present study.

Table 1

The variance analysis of main buffaloes milk components according to lactation (I-III) and season

Traits	The variance analysis for the influence factor	Lactation (f value and significance of difference)								
		I			II			III		
		n	X	F	n	X	F	n	X	F
Fat (%)	Season(A)			2.044 ^{ns}			1.254 ^{ns}			0.574 ^{ns}
	Month (B)	25	8.893	3.832 ^{ns}	15	7.686	0.933 ^{ns}	11	7.234	0.057 ^{ns}
	AB			0.478 ^{ns}			0.103 ^{ns}			4.588 ^{**}
Protein (%)	Season (A)			1.728 ^{ns}			0.012 ^{ns}			0.003 ^{ns}
	Month (B)	25	5.200	1.615 ^{ns}	15	5.190	0.619 ^{ns}	11	5.203	0.504 ^{ns}
	AB			0.454 ^{ns}			1.791 ^{ns}			1.928 ^{ns}
Lactose %	Season(A)			0.712 ^{ns}			0.007 ^{ns}			1.596 ^{ns}
	Month (B)	25	4.190	0.743 ^{ns}	15	4.293	1.106 ^{ns}	11	4.948	1.596 ^{ns}
	AB			1.160 ^{ns}			0.567 ^{ns}			2.286 ^{ns}
Non-lipid dry matter (%)	Season(A)			1.274 ^{ns}			2.170 ^{ns}			1.554 ^{ns}
	Month (B)	25	10.583	0.670 ^{ns}	15	10.666	0.707 ^{ns}	11	10.473	3.630 [*]
	AB			8.555 ^{**}			0.730 ^{ns}			0.903 ^{ns}
Density (g/cm ³)	Season(A)			0.321 ^{ns}			1.094 ^{ns}			3.035 ^{ns}
	Month (B)	25	29.373	2.794 [*]	15	27.516	0.047 ^{ns}	11	32.100	0.433 ^{ns}
	AB			2.578 [*]			0.062 ^{ns}			0.376 ^{ns}
pH	Season(A)			1.852 ^{ns}			1.364 ^{ns}			2.548 ^{ns}
	Month (B)	25	5.552	0.279 ^{ns}	15	5.672	2.670 ^{ns}	11	5.600	1.496 ^{ns}
	AB			0.216 ^{ns}			1.950 ^{ns}			0.703 ^{ns}

n – number of individuals, X – the average value, F - the significance of the differences.

Table 2

The variance analysis of main buffaloes milk components according to lactation (IV-V) and season

Traits	The variance analysis for the influence factor	Lactation (F value and significance of difference)					
		IV			V		
		n	X	F	n	X	F
Fat (%)	Season (A)			0.913 ^{ns}			0.184 ^{ns}
	Month (B)	12	8.081	0.511 ^{ns}	9	8.263	0.258 ^{ns}
	AB			2.273 ^{ns}			0.453 ^{ns}
Proteins (%)	Season (A)			0.885 ^{ns}			0.994 ^{ns}
	Month (B)	12	5.175	0.017 ^{ns}	9	5.423	0.990 ^{ns}
	AB			0.791 ^{ns}			0.998 ^{ns}
Lactose (%)	Season (A)			0.966 ^{ns}			0.135 ^{ns}
	Month (B)	12	4.454	0.263 ^{ns}	9	4.196	0.850 ^{ns}
	AB			0.080 ^{ns}			0.048 ^{ns}
Non-lipid dry matter (%)	Season (A)			0.885 ^{ns}			3.025 ^{ns}
	Month (B)	12	10.716	0.017 ^{ns}	9	10.508	0.206 ^{ns}
	AB			0.791 ^{ns}			0.081 ^{ns}
Density (g/cm ³)	Season (A)			0.159 ^{ns}			1.908 ^{ns}
	Month (B)	12	30.840	0.588 ^{ns}	9	30.135	1.716 ^{ns}
	AB			5.162 [*]			0.084 ^{ns}
pH	Season (A)			1.860 ^{ns}			0.994 ^{ns}
	Month (B)	12	5.916	0.175 ^{ns}	9	5.605	0.995 ^{ns}
	AB			0.159 ^{ns}			1.006 ^{ns}

n – number of individuals, X – the average value, F - the significance of the differences.

Conclusions. The main components of the studied buffalo's milk recorded values within those reported by other researchers who performed similar studies on different population of Romanian buffaloes. Investigations have highlighted the need for updated technology for the control of milk production, together with the increase of the reared buffalo effectives in private system, which dramatically decreased in last years, and also is imperative the modernization of the rearing and operating systems.

The buffalo exploitation technique is traditional and the milking is performed manually in this case. Herds of buffaloes from county of Sălaj exhibit favorable traits for milk production.

Some actions were taken for the improvement of existing populations through artificial insemination with seminal material from Murrah bulls. However, in this area, high quantities of buffalo milk are not suitably capitalized, as many breeders prefer to use it for their own consumption and for feeding other animals, due to the very low price paid.

Acknowledgements. Financial support was granted from Romanian Ministry of Education, Research and Innovation, project PN II-RU-TE No. 108/2010.

References

- Asif M., 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.
- Aspilcueta-Borquis R. R., Di Palo R., Araujo Neto F. R., Baldi F., De Camargo G. M. F., De Albuquerque L. G., Zicarelli L., Tonhati H., 2010 Genetic parameter estimates for buffalo milk yield, milk quality and mozzarella production and Bayesian inference analysis of their relationships. *Genet Mol Res* **9**(3): 1636-1644.
- Bei-Zhong H. Y., Meag L. M., Ying-Yang X., Zheng F., Qing Z. K., Nout M. J. R., 2007 A survey on the microbiological and chemical composition of buffalo milk in China. *Food Control* **18**(6): 742-746.
- Bud I., 1984 Contribuții la caracterizarea morfoproductivă a bubalinelor din nord-vestul Transilvaniei. PhD Thesis abstract, Tipo. Agronomia, Cluj-Napoca.
- Bufano G., Carnicella D., De Palo P., Laudadio V., Celano G., Dario C., 2006 The effect of calving season on milk production in water buffalo (*Bubalus bubalis*). *Arch Latinoam Prod Anim* **14**(2): 60-61.
- Catillo G., Macciotta N. P. P., Carretta A., Cappio-Borlino A., 2002 Effects of age and calving season on lactation curves of milk production traits in Italian water buffaloes. *J Dairy Sci* **85**: 1298-1306.
- Coroian A., Coroian C. O., Vodnar D. C., Trif M., Mireșan V., Răducu C., 2011 Study on some milk production indices of Romanian buffalo. *ABAH Bioflux* **3**(1): 10-17.
- Creța V., Comănici G., 1977 Unele probleme privind creșterea și exploatarea bubalinelor. *Revista de creșterea animalelor, București*, nr. 4.
- Ganguli N. C., 1974 Physico-chemical make-up of buffalo milk in the standardization of techniques of handling processing and manufacture of products. XIX Int. Dairy Cong. B5: 358-377.
- Georgescu G., Râmneanțu N., 1990 Tehnologia creșterii bovinelor. Editura Didactică și Pedagogică, București.
- Ghada Z., Soliman A., 2005 Comparison of chemical and mineral content of milk from human, cow, buffalo, camel and goat in Egypt. *The Egyptian Journal of Hospital Medicine* **21**: 116-130.
- Khan M. A. S., Islam M. N., Siddiki M. S. R., 2007 Physical and chemical composition of swamp and water buffalo milk: a comparative study. *Ital J Anim Sci* **6**: 1067-1070.
- Kuldip C. S., Veer K. S., Singh S., 2000 A comparative gross and lipid composition of Murrah breed of buffalo and cross-bred cow's milk during different lactation stages. *Arch Tierz Dummerstorf* **43**(2): 123-130.
- Pucleanu C., 2000 Cercetări privind cunoașterea unor parametri morfologici, fiziologici și productivi la bivolițe, în relație cu diferiți factori de influență. PhD Thesis, București.

- Rosati A., Van Vleck L. D., 2002 Estimation of genetic parameters for milk, fat, protein and mozzarella cheese production for the Italian river buffalo *Bubalus bubalis* population. *Livestock Production Science* **74**:185–190.
- Uallah S., Ahmad T., Bilal M. Q., Zia-ur-Rahman, Muhammad G., Rahman S. U., 2005 The effect of severity of mastitis on protein and fat contents of buffalo milk. *Pakistan Veterinary Journal* **25**(1):1-4.
- Velea C., Zanc C. A., 2010 Creșterea și exploatarea bubalinelor. Editura Texte, Dej.
- Velea C., Elisei L., Cristea C., David V., Vomir M., Tranc V., 1990 Efectul sezonal asupra producției de lapte la bivolițe. Simpozionul Actualități și perspective în Zootehnie, USAMV Cluj-Napoca, vol. XVI.
- Velea C., Mărginean G., 2006 Actualitate și perspectivă în creșterea bubalinelor. *Agrotehnica*, București.

Received: 24 November 2011. Accepted: 30 November 2011. Published online: 21 December 2011.

Authors:

Aurelia Coroian, University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, Faculty of Animal Husbandry and Biotechnology, Mănăștur Street, No. 3-5, 400372, Cluj-Napoca, Romania, e-mail: coroian.aurelia@gmail.com

Cristian Ovidiu Coroian, University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, Faculty of Animal Husbandry and Biotechnology, Mănăștur Street, No. 3-5, 400372, Cluj-Napoca, Romania, e-mail: cristian_coroian@yahoo.com

Cristian Tudor Matea, University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, Faculty of Agriculture, Mănăștur Street, No. 3-5, 400372, Cluj-Napoca, Romania, e-mail: mateatcristian@gmail.com

Vioara Mireșan, University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, Faculty of Animal Husbandry and Biotechnology, Mănăștur Street, No. 3-5, 400372, Cluj-Napoca, Romania, e-mail: vmiresan@usamvcluj.ro

Antonia Odagiu, University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, Faculty of Agriculture, Mănăștur Street, No. 3-5, 400372, Cluj-Napoca, Romania, e-mail: aodagiu@gmail.com

Camelia Răducu, University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, Faculty of Animal Husbandry and Biotechnology, Mănăștur Street, No. 3-5, 400372, Cluj-Napoca, Romania, e-mail: craducu2001@yahoo.com

Stelian Dărăban, University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, Faculty of Animal Husbandry and Biotechnology, Mănăștur Street, No. 3-5, 400372, Cluj-Napoca, Romania, e-mail: ovineusamv@yahoo.com

How to cite this article:

Coroian A., Coroian C. O., Matea C. T., Mireșan V., Odagiu A., Răducu C., Dărăban S., 2011 Characterization of some milk components, function of lactation, in buffaloes. *ABAH Bioflux* **3**(2):135-140.