

VARIATIONS OF FATTY ACIDS IN RAGUSANA ASS'S MILK DURING LACTATION

Biagina Chiofalo[#], Valeria Azzara, Lorena Venticinque, Domenica Piccolo,
Luigi Chiofalo.

*Dept. MO.BI.FI.P.A., Sect. Zootecnica e Nutrizione animale
University of Messina*

Abstract

Acidic composition of individual milk samples of 14 asses were investigated during the lactation (from 2nd to 6th day after parturition). No significant differences were observed for saturated and monounsaturated fatty acids, while polyunsaturated fatty acid percentages showed a significant variability ($P = 0.026$) between 4th and 5th month of lactation; the $\omega 6$ and $\omega 3$ content were higher than the levels observed in milk of other animal species. The essential fatty acids (linolenic and linoleic acids) were the most represented components of the PUFA class. The quality indices (Atherogenic and Thrombogenic) were lower than the milk of different animal species. These results confirm the bio-dietetic value of ass's milk, which is very similar to human milk, and suggest the potential economic value of the asinine breeding, providing an economic justification for breeding asses and preserving their natural environment, mostly represented by "marginal" areas, as well as with positive effects on animal biodiversity.

Key words: Ragusano donkey, milk, fatty acids.

Introduction

In the context of a research project that, through the characterisation of the most significant chemical and physical parameters of ass's milk, aims at the valorisation of this product and at a more accurate evaluation of the asinine genetic resources in Sicily (Chiofalo *et al.*, 2004) which are still quite well represented in Sicily (about 1400 heads), the influence of the lactation on the fatty acids of ass's milk of the Ragusana race was studied. On the basis of the advantages recognised in infant nutrition of the use of ass's milk, dietary and therapeutic properties (Carroccio *et al.*, 1999; 2000), the aim of this study was to deep the knowledge, considering the more limited information than that on mare's milk (Doureau *et al.*, 2002), and to exploit the role and the importance of milk fatty acids characterised by nutritional and extra-nutritional properties (Chiofalo and Salimei, 2001; Chiofalo *et al.*, 2003), reconsidering the zootechnic role of the donkey.

Material and Methods

The trial was carried out on 14 pluriparous and clinically healthy asses living in the Ragusana area and reared in semi-extensive condition. The animals, homogenous for Age (8 ± 1 years), Body Weight (300 ± 50 kg) and Body Condition Score (3 ± 0.5 ;

[#] Corresponding author: Dott. Biagina Chiofalo, Facoltà di Medicina Veterinaria, Polo Universitario dell'Annunziata, 98168 Messina; phone +39-090356961; fax +39-090356569.
e-mail adress: biagina.chiofalo@unime.it (B. Chiofalo)

measured on a 0 to 5 scale) (Martin-Rosset, 1990), utilized the available (3000 m²) spontaneous pasture integrated with commercial concentrate (2 kg/head/day), divided into two daily meals. During the winter the animals had at their disposal meadow hay *ad libitum*. The chemical composition of the feed (Table 1) was analyzed using the official methods (AOAC, 2000). Milk samples were collected, every days, from the 2nd to the 6th month of lactation, during the whole milking period. Foals were physically separated from the dams 3 hrs. before the milking. Acidic composition of individual milk samples were investigated using HRGC (Chiofalo and Salimei, 2001). Data were subjected to the analysis of variance (ANOVA, SAS – 2001) considering the variable: month of lactation.

Results and Discussion

No significant differences were observed for saturated (Figure 1) and monounsaturated (Figure 2) fatty acids, while polyunsaturated fatty acid percentages (Figure 3) showed a significant variability ($P= 0.026$) between 4th (15.93 ± 1.24) and 5th (20.27 ± 1.45) month of lactation; the $\omega 6$ content (Figure 4) was higher than $\omega 3$ (Figure 5). The essential fatty acids (linoleic and linolenic acids) (Figure 6) were the most represented components of the PUFA class (Salimei *et al.*, 2004) showing higher values than human milk and that of the other animal species (Chiofalo *et al.*, 2003; Fahey *et al.*, 2002; Martuzzi *et al.*, 1998). The quality indices, Atherogenic and Thrombogenic (Table 2), were lower than the milk of different animal species (Amerio and Elli, 1996; Chiofalo *et al.*, 2003). For these reasons ass's milk can be considered a "functional food" (Salimei *et al.*, 2002; Williams 2000).

Table 1 – Chemical composition of feeds (% on a DM basis)

	Concentrate	Hay
Dry Matter	90,22	93,83
Crude Protein	12,44	10,32
Ether Extract	1,36	2,29
Neutral Detergent Fibre	17,25	64,25
Ash	1,63	8,81
UFeq/Kg	0,98	0,50

Table 2 – $\omega 3/\omega 6$ and UFA/SFA ratios, quality indices during lactation (mean \pm SE).

	2 nd month	3 rd month	4 th month	5 th month	6 th month
$\omega 3/\omega 6$	0.85 \pm 0.03	0.71 \pm 0.02	0.93 \pm 0.03	0.63 \pm 0.02	0.76 \pm 0.03
UFA/SFA	1.15 \pm 0.08	1.15 \pm 0.08	1.18 \pm 0.08	1.16 \pm 0.09	1.26 \pm 0.10
Atherogenic I.	0.86 \pm 0.06	0.90 \pm 0.06	0.90 \pm 0.06	0.91 \pm 0.06	0.89 \pm 0.07
Thrombogenic I.	0.64 \pm 0.05	0.72 \pm 0.06	0.78 \pm 0.05	0.71 \pm 0.06	0.79 \pm 0.07

Fig. 1 – Variations of saturated fatty acids during the lactation (%)

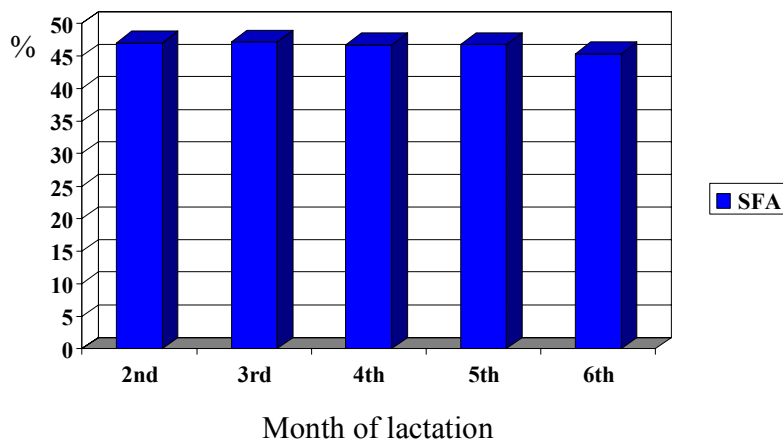


Fig. 2 – Variations of monounsaturated fatty acids during lactation (%)

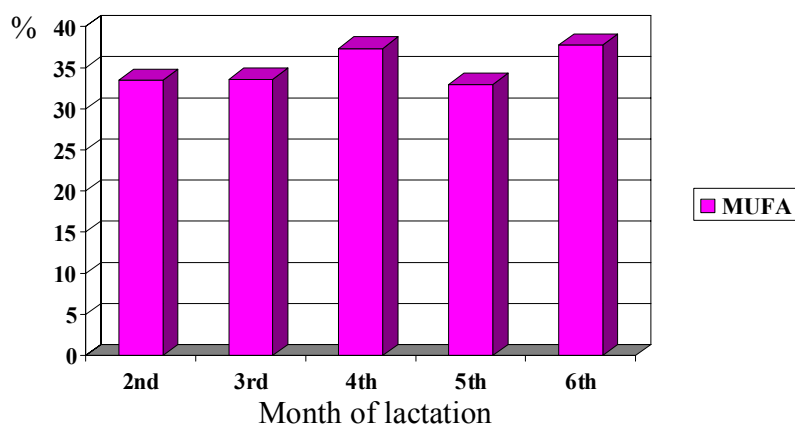


Fig. 3 – Variations of polyunsaturated fatty acids during lactation (%)

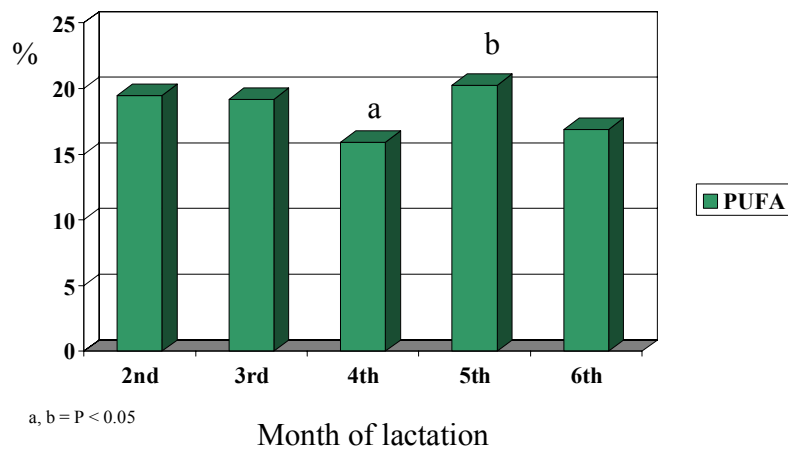


Fig. 4 – Variations of ω 6-PUFA during lactation (%)

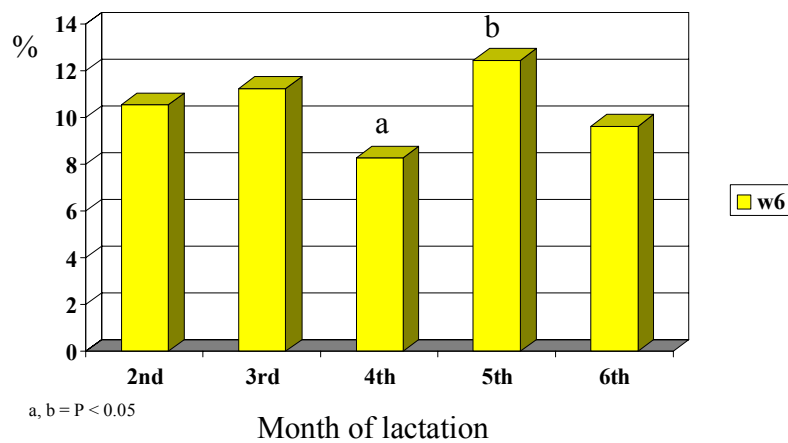


Fig. 5 – Variations of ω 3-PUFA during lactation (%)

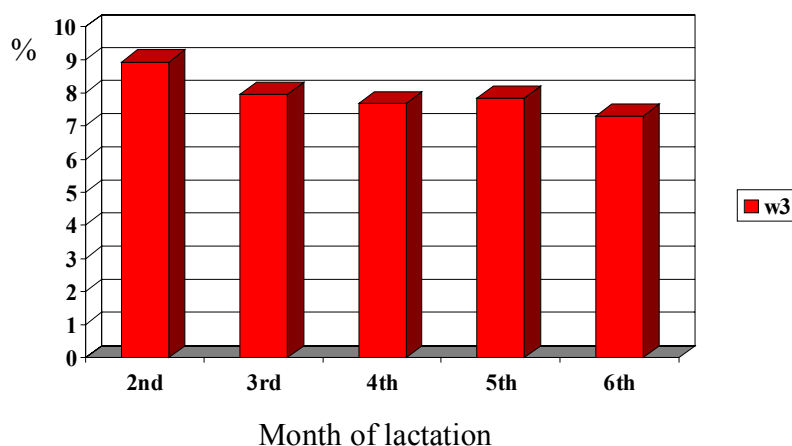
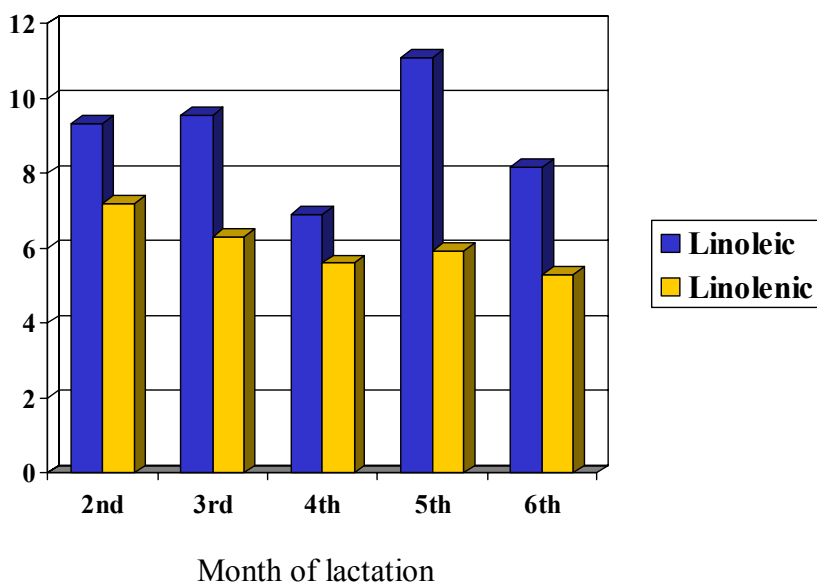


Fig. 6 – Variation of Essential fatty acids during lactation (%)



Conclusions

The results confirm the bio-nutritional value of ass's milk, and suggest the potential economic value of the asinine breeding. In fact, as a practical implication of the study, the wider uses of ass's milk could design new valorisation perspectives for this species, providing an economic justification for breeding asses with positive effects for the protection of its natural habitat, mostly represented by "marginal areas", as well as for animal biodiversity.

Acknowledgement

Research financed by PRIN 2003 (Prof. L. Chiofalo).

Bibliography

- Amerio M., Elli M. *Parliamo di... acquacoltura e pesca*. Ed. Edagricole, Bologna, 1996.
- A.O.A.C. Official Methods of Analysis of AOAC INTERNATIONAL, 17th ed., AOAC INTERNATIONAL, Suite 500, 481 North Frederick Avenue, Gaithersburg, Maryland USA, 2000.
- Carroccio A., Cavataio F., Iacono G. *Cross-reactivity between milk proteins of different animals*. Clin. Exp. Allergy, 29, 1014-1016, 1999.
- Carroccio A., Cavataio F., Montaldo G., D'Amico D., Alabrese L., Iacono G. *Intolerance to hydrolysed cow's milk proteins in infants: clinical characteristics and dietary treatments*. Clin. Exp. Allergy, 30, 1597-1603, 2000.
- Chiofalo B. and Salimei E. *Ass's milk: exploitation of an alimentary resource*. Riv. Folium, I, 235-241, 2001.
- Chiofalo B., Salimei E., Chiofalo L. *Acidi grassi nel latte d'asina: proprietà bionutrizionali ed extranutrizionali*. Large Animal Review, 6, 21-26, 2003.
- Chiofalo B., Azzara V., Liotta L., Chiofalo L. *I parametri chimico-fisici del latte di asina Ragusana nel corso della lattazione*. 6° Convegno "Nuove acquisizioni in materia di Ippologia". Proceedings. 77-84, 2004.
- Doreau M., Gaillard J.L., Chobert J.M., Léonil J., Egito A.S., Haertlé T. *Composition of mare and donkey milk fatty acids and protein and consequences on milk utilisation*. 4° Convegno "Nuove acquisizioni in materia di Ippologia". Proceedings. 51-71, 2002.
- Fahey J., Mee J.F., Murphy J.J., O'Callaghan D. *Effects of calcium salts of fatty acids and calcium salt of methionine hydroxyl analogue on plasma prostaglandin F_{2α} metabolite and milk fatty acids profiles in late lactation Holstein-Friesian cows*. Theriogenology, 58, 1471-1482, 2002.
- Martin-Rosset W. *Bases du rationnement*. In: Martin-Rosset W., L'alimentation des chevaux, Ed. INRA, Parigi, 1990.
- Martuzzi F., Summer A., Catalano A.L., Barbacini S., Mariani P. *Il contenuto di acidi grassi polinsaturi del grasso del latte di cavalla*. LII Convegno Nazionale S.I.S.Vet. Proceedings. 537-538, 1998.
- Salimei E., Coppola R., Fantuz F., Chiofalo B., Palazzo M., Belli Blanes R. *Composizione e peculiarità del latte di asina, un alimento per la prima infanzia*. 4° Convegno "Nuove acquisizioni in materia di Ippologia". Proceedings. 81-88, 2002.
- Salimei E., Fantuz F., Coppola R., Chiofalo B., Polidori P., Varisco G. *Composition and characteristics of ass's milk*. Anim. Res., 53, 67-78, 2004.
- SAS (2001). *User's Guide: Statistics*. Version 8.2.
- Williams C.M. *Dietary fatty acids and human health*. Ann. Zootech., 49, 165-180, 2000.