



Research on mare milk quality upon three breeds reared in Romania: Lipitan, Semigreu Romanesc and Furioso North Star

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Abstract. The chemical composition of milk varies according to different factors. The aim of this study is to verify if exists significant chemical differences between three popular mare breeds reared in Romanian. We find that there are no statistically significant differences in terms of the amount of fat (g/100 g) and the amount of protein (g/100 g) among the three breeds analyzed. Casein protein fraction (g/100 g) shows no statistically significant differences. All three breeds analyzed for the amount of lactose (g/100 g) showed statistically insignificant differences and no statistically significant differences are observed between the three breeds analyzed on pH, quantity of urea (mg/dL) and somatic cell number. Total solids show a good uniformity between breeds as well.

Key Words: fat, protein, casein, lactose, urea, pH, somatic cells.

Introduction. In Romania, mare milk is not consumed regularly and normally, but Asiatics are consuming it since ancient times.

Two thousand years ago, ancient dynasty emperors used to drink mare milk (<http://www.lapedeiapa.ro/>). In the Middle East, Arab sheiks drink it regularly to preserve health and youth (<http://www.lapedeiapa.ro/>). The energy provided by the mare milk is high due to its carbohydrate content (Di Cagno et al 2004; Malacarne et al 2002), because the fat content is very low (Doreau 1992; Malacarne 2002). Since there energy comes from carbohydrates, the effect is much faster than in cow milk, where the energy is provided by lipids. The chemical composition of milk varies according to different factors: the animal species, breed, individuality, the phase of lactation, health, weather, climate, the age of the animal (Patrascu & Patrascu 1985; Sutton & Morant 1989; Baer 1991; Grummer 1991; Palmquist et al 1993).

Material and Method. The biological material is constituted of fifteen mares of Lipitan breed - five from Beclean (Bistrita-Nasaud County) region and ten from Sambata de Jos (Brasov County), aged from five to eleven years, and fifteen mares belonging to individual breeds from Huedin area (Cluj County) - five Furioso North Star and ten Semigreu Romanesc, aged from six to eleven years.

Milk samples were hand milked, three hours after isolation of the foal. Foal isolation was necessary because the frequency of sucking makes impossible sampling without isolation. Milk collectors were sterile containers of 150-200 mL. Each sample was labeled with date (day of collection), mare age and breed.

After sampling, up to the time of analysis, the samples were stored frozen at -23°C.

Samples were taken from each experimental unit, during the months: April, May, June, July, August and September.

Analyses on the amount of fat, protein, casein, lactose, total solids and pH, urea and somatic cell count were performed using the Combifoss equipment, according to

European standards (ISO 9622 / IDF 141:2013). Study of the chemical composition of mare milk requires scientific and technological considerations.

The raw data were subjected to statistical processing, calculating the average and dispersion indices for each mare on the 6 months of lactation. They were tested by student test, differences analyzed by pointing the media and dispersion indices. Differences in the influence of breed and lactation month were tested by the Student test.

Results and Discussion. The composition of mare milk includes essential nutrients for the human and animal organism. There are no statistically significant differences concerning the quantity of fat (g/100 g) and the amount of protein (g/100 g) among the three breeds analyzed, averages ranging between 1.845 and 1.929 g/100 g in (Table 1, Figure 1) fat and 1.658 to 1.711 g/100 g in protein (Table 2, Figure 2). Casein fraction was analyzed between the three breeds and this fact showed no statistical significant differences, the values being very close one to each other, ranging between 0.768 and 0.778 g/100 g. All three breeds analyzed for the amount of lactose showed an average from 6.380 to 6.490 g/100 g (statistically insignificant differences).

Table 1
Average, dispersion indices, statistical differences and significance for fat (g/100 mg)

N	Breed	$\bar{x} \pm SE$	σ	CV (%)	Statistical differences and significance		
					L	SR	FNS
15	Lipitan	1.929±0.03	0.07	3.62	-	0.084 (NS)	-0.018 (NS)
10	Semigreu Romanesc	1.845±0.02	0.06	3.25	-	-	-0.066 (NS)
5	FNS	1.911±0.04	0.10	5.23	-	-	-

L - Lipitan breed, SR - Semigreu Romanesc breed, FNS - Furoso North Star breed, NS - not significant, N - number of samples, \bar{x} - mean, SE - standard error, σ - standard deviation, CV(%) - coefficient of variation.

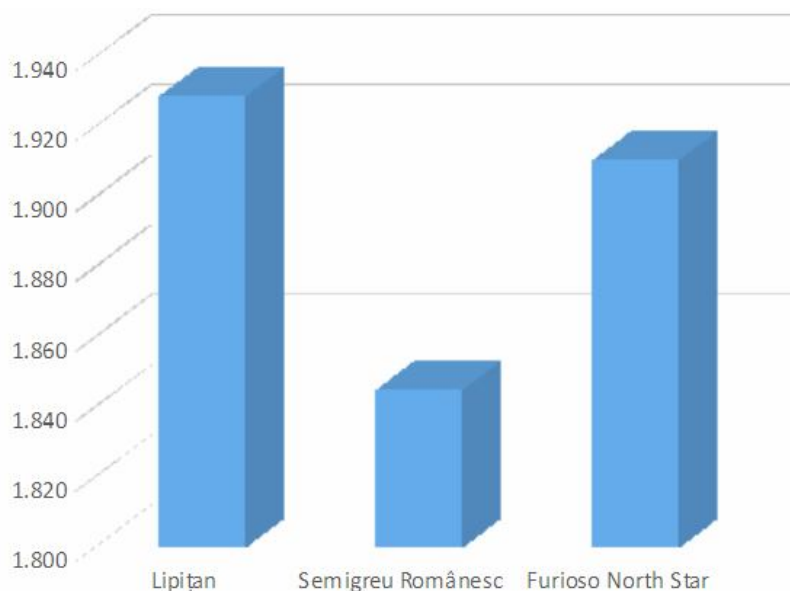


Figure 1. Average content of the milk fat (g/100 g) for the three breeds analyzed.

Concerning the amount of fat, the differences between breeds are very small, with values ranging from 0.018 g/100 g to 0.084 g/100 g. The highest percentage of fat represented by an average of 1.929±0.03 is recorded in Lipitan breed, and the lowest in Semigreu Romanesc with an average of 1.845±0.02.

Table 2
Average, dispersion indices, statistical differences and significance for protein (g/100 mg)

N	Breed	$\bar{x} \pm SE$	σ	CV (%)	Statistical differences and significance		
					L	SR	FNS
15	Lipițan	1.711 ± 0.02	0.06	3.41	-	0.008 (NS)	0.053 (NS)
10	Semigreu Românesc	1.703 ± 0.02	0.04	2.48	-	-	0.045 (NS)
5	FNS	1.658 ± 0.01	0.03	2.20	-	-	-

L - Lipitan breed, SR - Semigreu Romanesc breed, FNS - Furoso North Star breed, NS - not significant, N - number of samples, \bar{x} - mean, SE - standard error, σ - standard deviation, CV(%) - coefficient of variation.

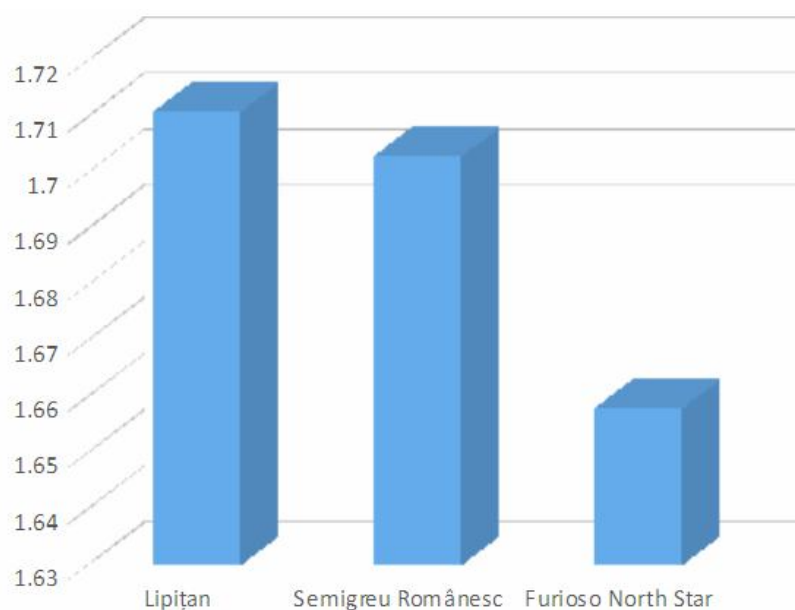


Figure 2. Average content of the milk protein (g/100 g) for the three breeds analyzed.

We note that for protein, we have a very good uniformity both within the breed and among breeds (V% between 2.20 and 2.48), the lowest average of 1.658±0.01 is realized by the five Furoso North Star mares and the highest 1.711±0.02, by the fifteen Lipitan mares.

We appreciate that we have a good homogeneity for casein, both within and between breeds; the differences are small and statistically insignificant. The highest variability (CV% = 4.01) is for Lipitan, and the lowest (V% = 2.57) for Furious North Star breed (Table 3, Figure 3).

Table 3
Average, dispersion indices, statistical differences and significance for casein (g/100 g)

N	Breed	$\bar{x} \pm SE$	σ	CV (%)	Statistical differences and significance		
					L	SR	FNS
15	Lipitan	0.748±0.02	0.03	4.01	-	-0.02 (NS)	-0.03 (NS)
10	Semigreu Românesc	0.768±0.01	0.02	2.60	-	-	-0.01 (NS)
5	FNS	0.778±0.01	0.02	2.57	-	-	-

L - Lipitan breed, SR - Semigreu Romanesc breed, FNS - Furoso North Star breed, NS - not significant, N - number of samples, \bar{x} - mean, SE - standard error, σ - standard deviation, CV(%) - coefficient of variation.

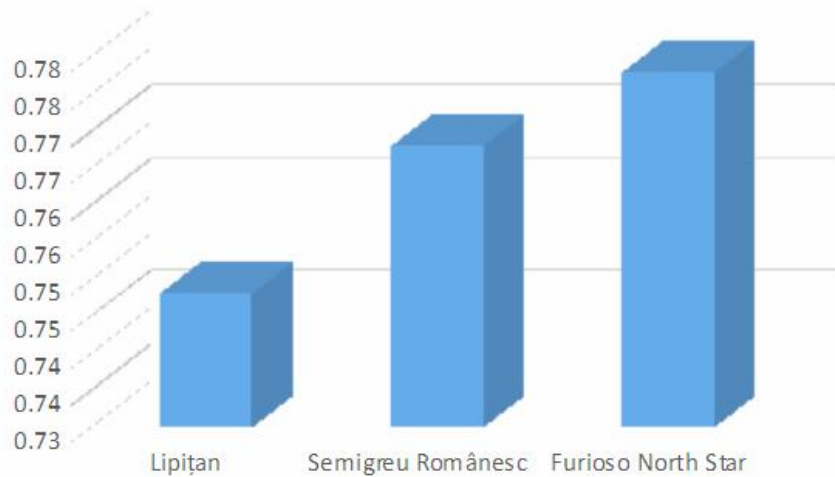


Figure 3. Average content of the casein (g/100 g) for the three breeds.

Analysis of lactose between the three studied breed show no significant differences, mean values are very close, with a maximum of 6.490 ± 0.05 reported in FNS breed and a minimum of 6.380 ± 0.04 in SR breed. The homogeneity for the lactose trait both among and between breeds is very good the coefficient for variation ranging between 1.41% and 2.30% (Table 4, Figure 4).

Table 4
Average, dispersion indices, statistical differences and significance for lactose (g/100 g)

N	Breed	$\bar{x} \pm SE$	σ	CV (%)	Statistical differences and significance		
					L	SR	FNS
15	Lipițan	6.441 ± 0.06	0.15	2.30	-	0.061 (NS)	-0.049 (NS)
10	Semigreu Românesc	6.380 ± 0.04	0.09	1.41	-	-	-0.11 (NS)
5	FNS	6.490 ± 0.05	0.12	1.90	-	-	-

L - Lipitan breed, SR - Semigreu Romanesc breed, FNS - Furoso North Star breed, NS - not significant, N - number of samples, \bar{x} - mean, SE - standard error, σ - standard deviation, CV(%) - coefficient of variation.

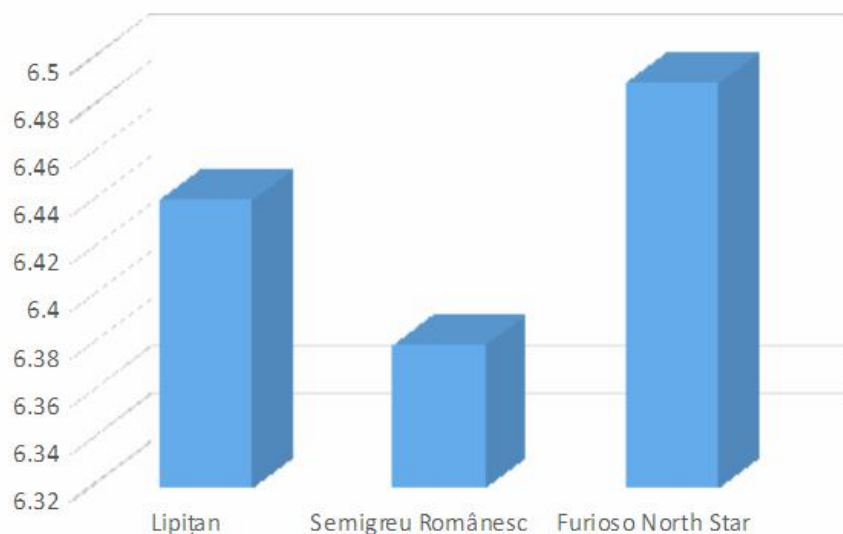


Figure 4. Average content of lactose (g/100 g) for the 3 breeds analyzed.

The milk pH values exhibit insignificant differences between samples. There is a great uniformity for this trait, both among and between breeds, the coefficient of variation shows values between 0.90% and 1.05% (Table 5, Figure 5).

Table 5

Average, dispersion indices, statistical differences and significance for pH

N	Breed	$\bar{x} \pm SE$	σ	CV (%)	Statistical differences and significance		
					L	SR	FNS
15	Lipițan	6.850±0.03	0.06	0.90	-	0.025 (NS)	0.047 (NS)
10	Semigreu Româneșc	6.825±0.03	0.06	0.93	-	-	0.022 (NS)
5	FNS	6.803±0.03	0.07	1.05	-	-	-

L - Lipitan breed, SR - Semigreu Romanesc breed, FNS - Furoso North Star breed, NS - not significant, N - number of samples, \bar{x} - mean, SE - standard error, σ - standard deviation, CV(%) - coefficient of variation.

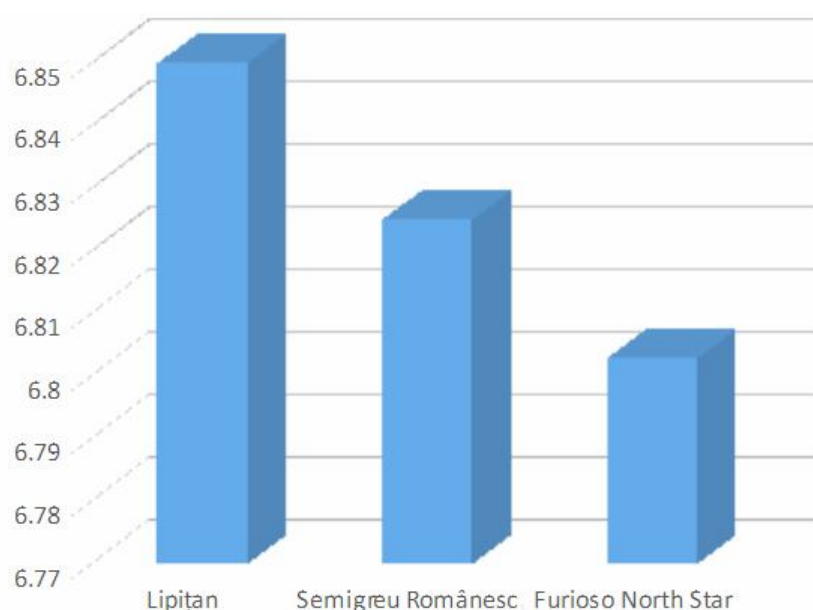


Figure 5. Average pH value of the milk from the analyzed three breeds.

The amount of urea has fluctuations from one month to another, but evolves equally to all three breeds studied. The differences between samples are insignificant (Table 6, Figure 6), and we believe that it is due primarily to the season, lactation and the type of forage administered.

Table 6

Average, dispersion indices, statistical differences and significance for urea (mg/dL)

N	Breed	$\bar{x} \pm SE$	σ	CV (%)	Statistical differences and significance		
					L	SR	FNS
15	Lipitan	20.833±0.96	2.35	11.28	-	-1.5 (NS)	-2.45 (NS)
10	Semigreu Româneșc	22.333±1.56	3.81	17.06	-	-	-0.95 (NS)
5	FNS	23.283±0.97	2.38	10.22	-	-	-

L - Lipitan breed, SR - Semigreu Romanesc breed, FNS - Furoso North Star breed, NS - not significant, N - number of samples, \bar{x} - mean, SE - standard error, σ - standard deviation, CV(%) - coefficient of variation.

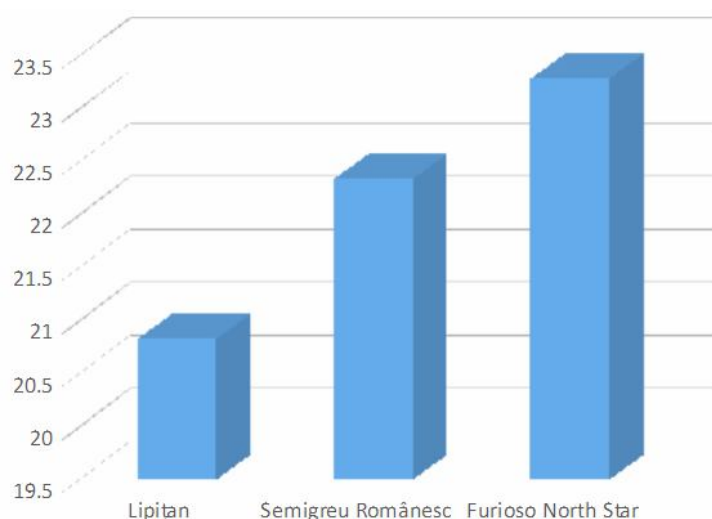


Figure 6. Average urea content (mg/dL) of the milk for the three breeds analyzed.

Higher coefficient of variation for somatic cells can be found for mares from FNS breed (Table 7, Figure 7), and we think this could be because the five animals are in possession of five different breeders, so environmental conditions could be significantly different in each case.

Table 7

Average, dispersion indices, statistical differences and significance for number of somatic cells (NCS/mL x 1000)

N	Breed	$\bar{x} \pm SE$	σ	CV (%)	Statistical differences and significance		
					L	SR	FNS
15	Lipițan	19.167±0.30	0.75	3.93	-	1 (NS)	-1 (NS)
10	Semigreu Românească	18.167±0.17	0.40	2.25	-	-	-2 (NS)
5	FNS	20.167±1.38	3.37	16.72	-	-	-

L - Lipițan breed, SR - Semigreu Romanesc breed, FNS - Furoso North Star breed, NS - not significant, N - number of samples, \bar{x} - mean, SE - standard error, σ - standard deviation, CV(%) - coefficient of variation.

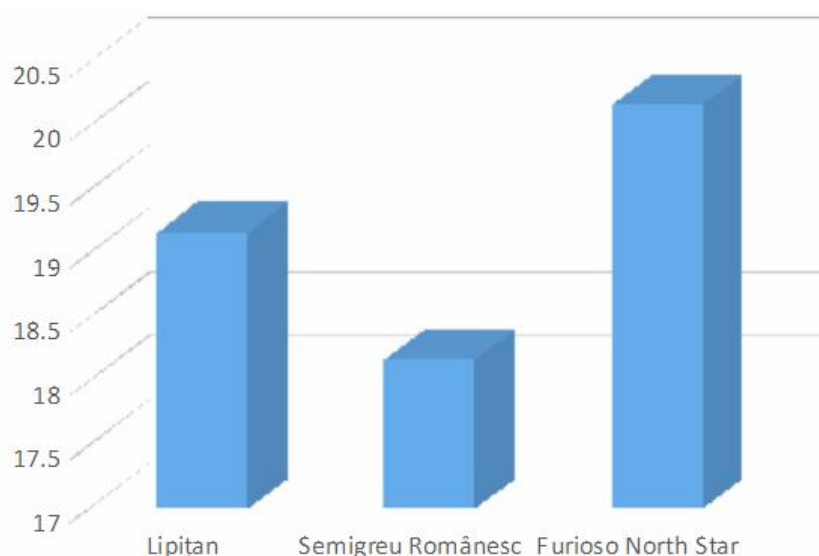


Figure 7. Average for NCS/mL x 1000 for the 3 breeds in study.

Concerning the dry matter trait, the homogeneity is very good, the coefficient of variation within and between breeds (0.86 to 1.17). At the three breeds analyzed, the average amount of dry matter exceeds 8.50 g/100 g (Table 8, Figure 8).

Table 8

Average, dispersion indices, statistical differences and significance for total solids nonfat (g/100 g)

n	Breed	$\bar{x} \pm SE$	σ	CV (%)	Statistical differences and significance		
					L	SR	FNS
15	Lipițan	8.660±0.03	0.07	0.86	-	0.138 (NS)	0.147(NS)
10	Semigreu Românesc	8.522±0.04	0.10	1.17	-	-	0.009 (NS)
5	FNS	8.513±0.04	0.09	1.04	-	-	-

L - Lipitan breed, SR - Semigreu Romanesc breed, FNS - Furoso North star breed, NS - not significant, N - number of samples, \bar{x} - mean, SE - standard error, σ - standard deviation, CV(%) - coefficient of variation.

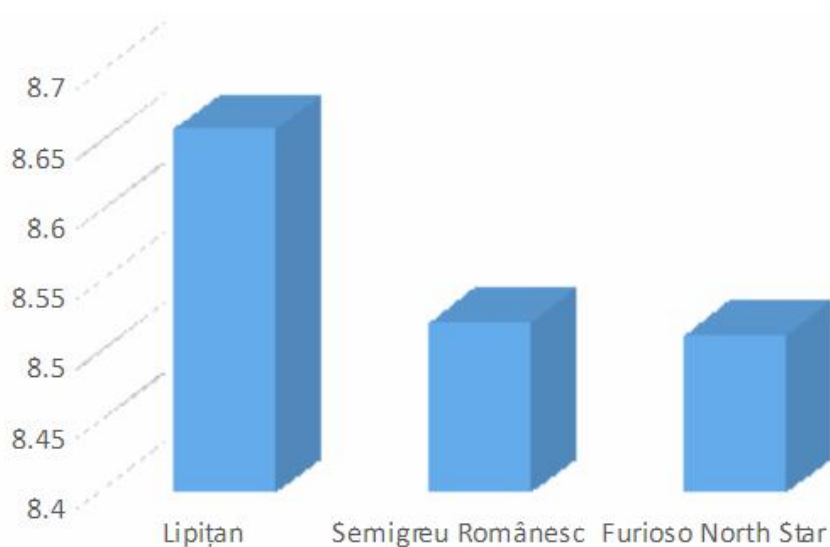


Figure 8. Average total solids (g/100 g) of the milk for the 3 breeds analyzed.

Conclusions. There are no statistically significant differences in terms of the amount of fat, protein, casein lactose, pH level, urea and somatic cells number. Total solids show a good uniformity between breeds as well. On the Romanian market there are no mare milk products like in other countries; where there are special farms specialized in certain food supplements or cosmetics, like soaps, shampoos, creams exclusively made from mare milk. The fact that the Romanian mares do not show differences between breeds, concerning the milk quality, shows the homogeneity in terms of milk components within the analyzed three breeds.

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