Sheep milk quality in the Basque Country community and Navarre from 1996 to 1998

Legarra A.

in

Rubino R. (ed.), Morand-Fehr P. (ed.).
Production systems and product quality in sheep and goats

Zaragoza : CIHEAM
Options Méditerranéennes : Série A. Séminaires Méditerranéens; n. 46

2001
pages 145-149

Sheep milk quality in the Basque Country community and Navarre from 1996 to 1998

A. Legarra* and F.J. Mendizabal**
*NEIKER Basque Institute for Agricultural Research, Granja modelo de Arkaute,
Apdo. 46, 01080 Vitoria-Gasteiz, Spain
**Carlos III, 2. Pamplona, Spain

SUMMARY – A data set of 43,536 tank milk samples representing the population of the Latxa breed in Navarre and the Basque Country community was analysed. Monthly averages showed a typical increasing tendency for fat and protein contents and somatic cell count throughout the lactation and no variation in total bacterial count was found. As for hygienic quality, it was either good or bad, with few intermediate cases, showing that this can be a feasible objective. Different mean values were calculated by regions and seasons, showing that milk contents were slightly higher in early lambing systems (winter). No clear tendencies were observed for somatic cell and total bacteria counts, but differences existed between regions.

Key words: Milk quality, Latxa, dairy sheep, management system.

RESUME – *"Qualité du lait de brebis de la Communauté Autonome du Pays Basque et de Navarre de 1996 à 1998". On a étudié 43 536 résultats d'analyse d'échantillons de lait du troupeau provenant de la population de la brebis Latxa dans la Navarre et la Communauté Autonome du Pays Basque. Les moyennes mensuelles des taux butyreux et protéique et des comptages de cellules somatiques augmentent au long de la lactation. Le comptage de bactéries reste le même. La qualité hygiénique du lait a été, soit bonne, soit mauvaise, et on déduit que la bonne qualité hygiénique est faisable. Différentes moyennes ont été calculées pour chaque région et saison. La composition du lait a été légerèment supérieure dans les regions avec saisons d'agnelages précoces (hivernales). Les comptages de cellules et bactéries ont été différents entre régions, mais sans une tendance claire.*

Mots-clés : *Qualité du lait, Latxa, brebis laitière, conduite.*

Introduction

The Instituto Lactológico de Lekunberri (Navarre) carried out two reports (Legarra and Mendizabal, 1997, 1998) on sheep milk characteristics from the total amount of analysis realised between January 1996 and August 1998. The Institute analyses milk tank samples collected by: (i) cheese factories from their provider flocks; (ii) the milk recording program; and (iii) cheese-maker shepherds for self-control.

The objective of this work was to describe milk quality by regions and seasonal evolution. Since some characteristics of the main management system for each zone were formerly described (Armendáriz *et al*., 1987a,b; Urarte, 1989; Armendáriz and Lasarte, 1991; Ruiz *et al*., 1996), different evolutions in milk quality could be related to those management systems.

Material and methods

The studied area was the Basque Country community (CAPV) and Navarre, coinciding with the extension of the Latxa breed. Eight different groups were considered (see Fig. 1): the three historical regions in the CAPV (Alava, Gipuzkoa and Bizkaia), three regions in Navarre (Atlantic, Northwest and Pyrenees), and the milk recording samples from the CAPV and from Navarre. Milk control samples could not be classified by geographical location due to limitations in the database utilised, but regional groups remained representative of the general population as most of the herds in milk recording are present by cheese factory or self-control samples.

According to Armendáriz *et al*. (1987a,b) and Urarte (1989), Table 1 shows the lambing

characteristics in each region. These features are mainly related to the local environment: climate and relief, which are also presented. The region of Navarre Pyrenees presents mixed lambing features, due to recent changes in the production system in some herds (M.J. Armendáriz, pers. comm.). In addition to that, the flocks of Alava and Northwest Navarre are the biggest ones and those that mostly use mountain pastures.

Fig. 1. Regions in Navarre and the CAPV.

Table 1. Characteristics of the different regions

Group	Lambing season	Lambing lengthening	Altitude (m)	Annual rainfall (l/m^2)
Alava	Late	Long	400-800	800-1200
Bizkaia	Late	Long	200-500	1500-2000
Gipuzkoa	Early	Very long	200-500	1500-2000
Navarre Atlantic	Early	Very long	200-500	1500-2000
Navarre Northwest	Late	Long	400-800	800-1200
Navarre Pyrenees	Very late/early	Short/very long	700-900	1500-2000

From a total of 43,536 records with fat and protein percentage, 43,014 and 33,335 records also provided Somatic Cell Count (SCC) and Total Bacteria Count (TBC). Both features showed exponential distributions and, in order to achieve gaussian distributions, a logarithmic transformation was done. Afterwards, results are presented by exponentiation of the results of the transformed variable. Moreover, the main data set was generated calculating monthly average values for each flock to reduce the sampling error. So, the number of records was reduced to 16,442 for fat and protein contents and SCC log, and 15,487 for TBC log. Seasonal distribution of records was the following: 41% in winter, 49% in spring, 7% in summer and 3% in autumn. The last two seasons are considered as not representative of the general management system in Latxa breed. They were only considered in the annual evolution. Hence, means and standard deviations were calculated for the whole population per month, zone and season.

Several analysis of variance were made with the Proc GLM of SAS (SAS, 1988) taking into account the following effects: group, season, and the interaction group-season. Samples collected during summer and autumn were excluded for this analysis. Signification levels between average values were calculated by means of the Duncan test.

Results and discussion

Figure 2 shows the monthly evolution of means of fat and protein percentages, and upper and lower limits for a 95% population interval. From January to April fat and protein contents

remained at similar levels. This can be explained by the continuous entrance of sheep to milking. New animals enter with higher yields and lower milk contents, compensating the increasing percentages of those ones that were already being milked. This entrance of new animals decreases from May on, and the lactation stage of the milking ewes evolves. This fact with the change in feeding practices (spring grazing) contributes to the increasing tendency observed in milk contents.

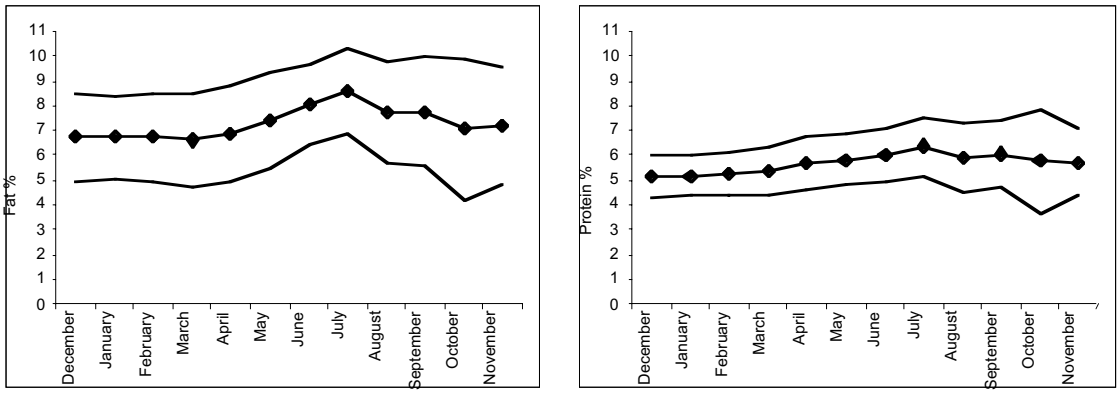

Fig. 2. Annual evolution of fat and protein percentages and 95% population interval.

SCC and TBC monthly average values, and upper and lower limits for a 95% population interval, are showed in Fig. 3 (taking the antilogarithms of the results obtained with the transformed variable). The tendency of SCC from January to July is similar to the one of fat and protein. TBC does not change.

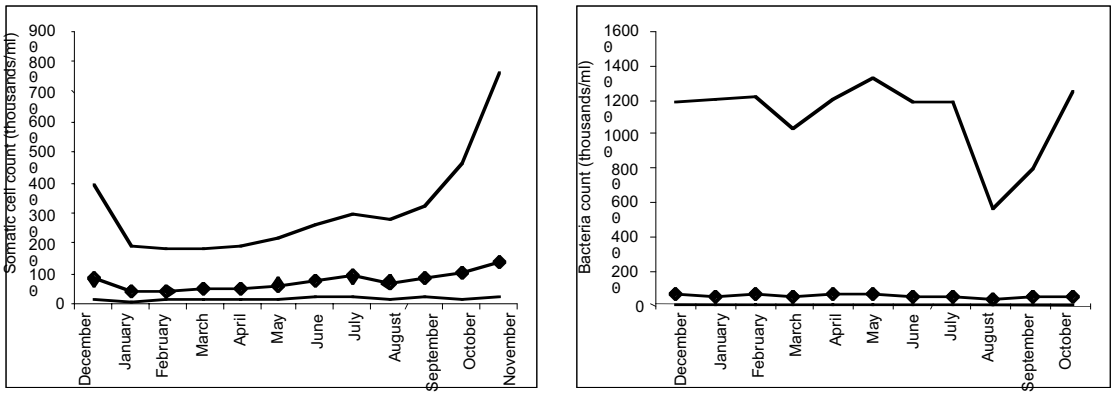

Fig. 3. Annual evolution of somatic cell and total bacterial counts and 95% population interval.

Table 2 shows SCC and TBC distributions. They showed clear bimodal distributions, which means that most of the samples were either good (40% of the samples had less than 300,000 bacteria/ml) or bad (36% with more than 1 million bacteria/ml). It seems to be easier to reduce TBC than SCC, since the reduction of bacteria contamination is a question of good hygienic practices.

The analysis of variance showed that all effects (season, group, and group-season interaction) were statistically significant ($P<0.001$) except the group-season interaction for the SCC logarithm, which was not significant at any probability level. The estimated effects were very close to the means, so only means are presented here.

In Table 3 mean values of fat and protein percentages are showed per group, for the two main seasons and the whole year. Differences were small in fat content, and even smaller in

protein. Samples from flocks under milk recording had lower fat content (and protein in Navarre) than those of the same zone collected out of the milk recording program. This may be due to higher productions of animals of such flocks and the consequent effect of dilution of the contents.

Table 2. Distribution of somatic cell and total bacterial counts (thousands/ml)

Range	n		%	
	Cell	Bacteria	Cell	Bacteria
0-100	203	1279	1.24	8.26
100-200	1026	3047	6.25	19.67
200-300	1640	1781	9.98	11.50
300-400	1851	1119	11.27	7.23
400-500	1902	722	11.58	4.66
500-600	1737	544	10.57	3.51
600-700	1519	428	9.25	2.76
700-800	1219	360	7.42	2.32
800-900	997	304	6.07	1.96
900-1000	844	288	5.14	1.86
>1000	3490	5615	21.24	36.26

Table 3. Means of fat and protein percentage per group and season

Group	Fat %			Protein %		
	Winter	Spring	Year	Winter	Spring	Year
Navarre milk recording	6.48^{af}	7.31^{a}	6.97^{a}	5.20^{a}	5.74^{ab}	5.50^{a}
CAPV milk recording	6.20^{b}	7.10^{b}	6.76^{b}	5.32^{b}	5.69^{a}	5.53^{a}
Navarre Pyrenees	6.94^{c}	7.54^{c}	7.29^{c}	5.13^{a}	5.81^{bc}	5.52^{a}
Navarre Atlantic	6.95^{c}	7.60^{c}	7.24^{cd}	5.44^{c}	5.97^{d}	5.67^{b}
Navarre Northwest	6.56^{a}	7.30^{a}	7.01^{a}	5.16^{a}	5.76^{ab}	5.51^{a}
Gipuzkoa	6.75^{d}	7.60^{c}	7.16^{d}	5.32^{b}	5.87^{c}	5.59^{c}
Alava	5.96^{e}	6.83^{d}	6.61^{e}	4.94^{d}	5.57^{e}	5.41^{d}
Bizkaia	6.41^{f}	6.99^{b}	6.80^{b}	5.21^{a}	5.52^{e}	5.45^{d}

^{a,b,c,d,e,f}Values with the same letter do not differ significantly ($P<0.05$).

The highest values of fat and protein contents corresponded to Gipuzkoa, Atlantic Navarre and Pyrenees, and the lowest are always found in Alava. This can be related to the features of the predominant lambing season in each zone (although Pyrenees system is not well known). In general, zones of early lambings presented higher values of fat and protein content.

Biggest differences corresponded to SCC and TBC (see Table 4). Flocks under milk recording showed lower levels, as it happened with fat and protein contents. In both SCC and TBC, a higher level of professional knowledge and a good advice service could be the main reasons. As for SCC, a dilution effect could also be observed. Another remarkable point is the systematic better quality observed in Navarre in relation to the CAPV, while systems appear to be similar.

Table 4. Geometric means of Somatic Cell and Total Bacteria Count per group and season

Group	Somatic cell count (thousands/ml)			Total bacterial count (thousands/ml)		
	Winter	Spring	Year	Winter	Spring	Year
Navarre milk recording	355[a]	432[a]	395[a]	137[a]	172[a]	156[a]
CAPV milk recording	538[bd]	602[b]	583[b]	318[b]	349[b]	336[b]
Navarre Pyrenees	466[c]	569[b]	523[c]	246[c]	236[c]	238[c]
Navarre Atlantic	382[a]	481[c]	422[a]	547[d]	539[d]	546[d]
Navarre Northwest	502[bc]	613[b]	565[b]	616[d]	771[e]	702[e]
Gipuzkoa	499[bc]	612[b]	562[b]	1007[e]	907[ef]	954[f]
Alava	566[d]	709[d]	670[d]	675[d]	1060[f]	938[f]
Bizkaia	582[d]	676[d]	646[d]	1283[f]	1093[f]	1140[g]

[a,b,c,d,e,f,g]Values with the same letter do not differ significantly (P<0.05).

Conclusions

Although both were low, variability in fat content was greater than in protein. Variability was higher for Cell and Bacteria counts, which determine hygienic quality. In this sense, most of the samples could be classified as either good or bad. So production of milk with a good hygienic quality is a feasible objective.

Differences in milk composition between zones may be explained by differences in the management system: zones with early lambing season showed higher fat and protein contents than those of later lambing season. Although differences in hygienic quality between zones were *clear and important*, an obvious relationship with the management system was difficult to be established.

References

Armendáriz, M.J., Hualde, J.M. and Maeztu, F.A. (1987a). Gestión de ovino de leche. *Navarra Agraria,* 23: 73-80.

Armendáriz, M.J., Hualde, J.M. and Maeztu, F.A. (1987b). Gestión de ovino de leche en la zona noroeste. *Navarra Agraria,* 24: 97-100.

Armendáriz, M.J. and Lasarte, J.M. (1991). Evolución del porcentaje de leche dentro del producto bruto en las últimas tres campañas 87-88, 88-89, 89-90. *ITEA*, Vol. extra 11: 394-396.

Legarra, A. and Mendizábal, F.J. (1997). *Estudio de los resultados de análisis de muestras de leche de oveja en el Instituto Lactológico de Lekunberri durante los años 1996 y 1997*. Report prepared for the Instituto Lactológico de Lekunberri, Lekunberri, Navarra.

Legarra, A. and Mendizábal, F.J. (1998). *Estudio de los resultados de análisis de muestras de leche de oveja en el Instituto Lactológico de Lekunberri en la campaña 1997-1998*. Report prepared for the Instituto Lactológico de Lekunberri, Lekunberri, Navarra.

Ruiz, R., Oregui, L.M. and Bravo, M.V. (1996). Productive characteristics of dairy ewe flocks in the Basque Country. In: *Livestock Farming Systems: More than Food Production*, J.T. Sørensen (ed.), EAAP Publ., No. 89. Wageningen Pers, Wageningen, pp: 42-47.

SAS (1988). *SAS Users' Guide.* SAS Institute, Cary, USA.

Urarte, E. (1989). *La raza Latxa: Sistemas de producción y características reproductivas*. PhD Thesis, University of Zaragoza.