

The fat and protein content of the sheep milk under different conditions

A. Jávör*, S. Kukovics**, A. Nábrádi*, Zs. Várszegi*, M. Árnási* and Gy. Molnár*

*Debrecen Agricultural University of Agricultural Sciences,
Böszörményi str. 138, Debrecen, 4032 Hungary

**Research Institute for Animal Breeding and Nutrition,
Gesztenyés str. 1, Herceghalom, 2053 Hungary

SUMMARY – In Hungary the Hungarian Combing Merino has been and still is the most common sheep breed. In order to increase the milk production traits, especially the milk components, several crossings were made. In an experiment lasting three years the fat, protein and dry matter contents of the milk produced by ewes belonging to different genotypes: Merino, (Merino x East-Friesian) F₁, (Merino x Langhe) F₁, (Merino x Sarda) F₁, (Merino x Plevén) F₁ and (Merino x Awassi) F₁ were studied. The test milkings of the ewes were carried out fortnightly, twice a day. From the study the following conclusions could be drawn: (i) the East-Friesian F₁ ewes produced the largest amount of fat, protein and dry matter in their milk; followed by Langhe F₁, Sarda F₁, Plevén F₁, Awassi F₁ and Merinos in the ranking; (ii) the improvement in conditions gave an increased yield of the studied traits; and (iii) the pre-selection of Merinos on the basis of milk production should be made prior to the start of crossbreeding considering to increase the milk production traits.

Key words: Ewe milk, protein, fat, fat free dry matter, production system.

RESUME – "Teneur en matière grasse et protéine des brebis laitières sous différentes conditions". Actuellement, comme dans le passé, le mérinos (peigné) est la race la plus étendue en Hongrie. Plusieurs croisements ont été faits afin d'améliorer les caractères de la production laitière, et la composition du lait, en particulier. Pendant trois années, les teneurs en matière grasse, en matière sèche et en protéine ont été enregistrées chez les brebis des génotypes suivants : Mérinos, Frisen F₁, Langhe F₁, Sarda F₁, Plevén F₁, Awassi F₁. Les traites d'essai ont été effectuées toutes les deux semaines, deux fois par jour. Les conclusions suivantes peuvent être tirées : (i) les teneurs les plus élevées en matière grasse, en matière sèche et en protéine ont été enregistrées chez la race Frisonne ; (ii) l'amélioration des conditions de production a élevé les qualités examinées ; et (iii) chez la pré-sélection de la race mérinos en précédant les croisements, l'amélioration des caractères de production de lait doit être aussi considérée.

Mots-clés : Lait de mouton, protéine, matière grasse, matière sèche sans gras, système de production.

Introduction

Among the products of sheep, milk production has to be emphasized because of several factors. One of these factors is our high quality wool production. The production indices in Hungary are near to the world's level, but the income from wool is only a small part of the total turnover. Meat production is already a common way of use. Milk production is the most undeveloped area, where there are many un-exploited possibilities. Especially the milk composition is the area, which could be developed rapidly.

It is also important, that sheep milk production could be continuous during the year. The market of sheep milk is not overstocked yet, thus sheep milk products could be sold without stint. The fact, that the ewes are able to produce at high level for several years, has to be considered.

The Hungarian "Fésűs Merino" (Combing Merino) is the most common breed in Hungary, however, its milk production is low under the present keeping and breeding conditions. The improvement through selection does not require considerable financial background. Quick and high level of improvement could be expected by using milk breeds for crossbreeding. When choosing the best crossing partner it is necessary to study several breeds.

The aim of the experiment was to study the production indices in the crossed/F₁/stocks belonging to different sheep genotypes.

Materials and methods

In the experiment, in addition to studying the production of the control Merino stock, 5 different breeds were used as crossing partners. The original, non-selected Merino ewes were inseminated with the sperm of Langhe, East-Friesian, Sarda, Pleven Blackhead and Awassi rams, so the studied genotypes were as follows:

- (i) Merino
- (ii) (Merino x East Friesian)F₁ /East Friesian F₁/
- (iii) (Merino x Langhe) F₁ /Langhe F₁/
- (iv) (Merino x Sarda) F₁ /Sarda F₁/
- (v) (Merino x Pleven Blackhead) F₁ /Pleven F₁/
- (vi) (Merino x Awassi) F₁ /Awassi F₁/

The experiment was carried out in two farms, and in two production systems: (i) under large scale conditions, with low production level /Low/; and (ii) under experimental conditions, with semi-intensive production level /High/.

The experiment was carried out through 3 years, 3 lactation periods. The ewes included in the study were milked fortnightly and milk was sampled (Kukovics *et al.*, 1988, 1992) two times a day. The high number of obtained data provided possibility for the in-depth analysis of the milk quality of genotypes.

The analyses carried out by automatic equipment (Milkcoscan 300) on the basis of Hungarian standards were as follows: (i) butterfat-; (ii) protein-; and (iii) fat-free dry matter content.

The collected data were processed in the Computer Laboratory of the Department of Animal Husbandry in Debrecen University of Agricultural Sciences, by IBM computers.

Due to different weather conditions, the fodder supply of the animals was also different in each year (Jávor *et al.*, 1993). In addition to this, reactions of the different genotypes to the different environmental conditions were also considered in the analyses of data.

Results and discussion

Each genotype reacted differently under different environmental conditions (Table 1). The better keeping and feeding conditions lead to higher fat content in the case of each variety. In the case of fat level, the situation was different: in 1990, because of more favourable conditions, the fat level of the varieties was lower, than that of in 1991. Regarding butterfat yield, the biggest difference could be seen in the case of Merino and Langhe F₁ (2.5 kg), while the smallest difference were observed in the case of Sarda F₁ (1.3 kg) ewes. Regarding fat level (%), the biggest difference was in the case of Merino (2.2%) while the smallest was found in the East-Friesian F₁-s (1.0%). In general, the most butterfat was yielded by the East-Friesian F₁ ewes.

The most protein was also produced by East-Friesian F₁ and Langhe F₁ sheep. Bigger differences occurred in protein % under the different environmental conditions than that were in the fat content. Under the better conditions, Langhe F₁ produced the most favourable values. Under better feeding and keeping conditions its milk protein production was higher by 3.35 kg. Difference was the smallest in the case of Merino (1.8 kg) ewes. The milk protein level was relatively similar, the difference was lower than in the case of milk protein yield. Even the biggest difference did not exceed the 1% (Table 2).

Regarding fat free dry matter yield, the East-Friesian F₁ was the best as well. Due to the better conditions, the production values of Langhe F₁ were considerably increased (+10 kg) which meant a 2.5 times higher value. The lowest dry matter content could be found in the milk of Merinos and the biggest differences could also be found in this breed (Table 3).

Table 1. Fat content and yield in the milk of the studied genotypes

Years	Production level	Genotype	Number of ewes	Butterfat yield (kg)	Butterfat (%)	Butterfat yield in comparison with the values of Merinos (%)	Butterfat % in comparison with the values of Merinos (%)
Year I	Low	Langhe F ₁	36	5.21	7.32	108	93
		Sarda F ₁	39	4.75	7.20	99	92
		East-Friesian F ₁	32	5.95	7.01	124	89
		Pleven F ₁	35	4.77	7.55	99	96
		Merino	41	4.81	7.86	100	100
Year II	Low	Langhe F ₁	17	2.97	7.31	127	92
		Sarda F ₁	23	3.78	7.59	162	96
		East-Friesian F ₁	14	4.35	7.27	186	92
		Pleven F ₁	20	3.29	7.84	141	99
		Merino	21	2.33	7.92	100	100
Year III	Low	Langhe F ₁	28	3.90	6.11	135	105
		Sarda F ₁	27	3.82	6.33	132	109
		East-Friesian F ₁	28	4.37	6.29	151	109
		Pleven F ₁	30	3.31	5.79	114	100
		Merino	22	2.89	5.80	100	100
Year I	High	Langhe F ₁	13	5.53	5.69	135	75
		Sarda F ₁	9	4.57	5.55	112	73
		East-Friesian F ₁	9	5.96	6.40	146	84
		Pleven F ₁	17	4.91	6.11	120	80
		Awassi F ₁	4	4.25	6.65	104	87
Year II	High	Merino	9	4.10	7.61	100	100
		Langhe F ₁	14	5.40	7.34	171	92
		Sarda F ₁	11	5.06	6.74	160	85
		East-Friesian F ₁	7	5.12	6.59	163	83
		Pleven F ₁	19	4.63	7.29	147	92
		Awassi F ₁	10	4.63	7.62	147	96
		Merino	6	3.15	7.96	100	100

Table 2. Protein yield and level in the milk of the studied genotypes

Years	Production level	Genotype	Number of sheep	Protein yield (kg)	Protein (%)	Protein yield in comparison with the values of Merinos (%)	Protein % in comparison with the values of Merinos (%)
Year I	Low	Langhe F ₁	36	4.45	6.15	119	101
		Sarda F ₁	39	3.97	6.03	107	99
		East-Friesian F ₁	32	5.02	5.94	135	98
		Pleven F ₁	35	3.96	6.17	106	101
		Merino	41	3.73	6.09	100	100
Year II	Low	Langhe F ₁	17	2.64	6.49	162	96
		Sarda F ₁	23	3.21	6.39	151	94
		East-Friesian F ₁	14	3.68	6.21	185	92
		Pleven F ₁	20	2.84	6.79	142	100
		Merino	21	2.00	6.78	100	100
Year III	Low	Langhe F ₁	28	3.98	6.54	126	99
		Sarda F ₁	27	3.74	6.34	118	94
		East-Friesian F ₁	28	4.27	6.40	135	95
		Pleven F ₁	30	3.58	6.73	113	100
		Merino	22	3.17	6.75	100	100
Year I	High	Langhe F ₁	13	6.03	6.28	178	92
		Sarda F ₁	9	5.15	6.25	152	92
		East-Friesian F ₁	9	5.87	5.86	173	86
		Pleven F ₁	17	5.15	6.37	152	94
		Awassi F ₁	4	3.99	6.22	118	91
Merino	9	3.39	6.80	100	100		
Year II	High	Langhe F ₁	14	4.49	6.17	169	89
		Sarda F ₁	11	4.49	5.88	165	85
		East-Friesian F ₁	7	4.45	5.74	167	83
		Pleven F ₁	19	3.97	6.38	149	92
		Awassi F ₁	10	3.62	6.01	136	87
Merino	6	2.67	6.95	100	100		

Table 3. Total fat free dry matter yield and content in the milk of the studied genotypes

Years	Production level	Genotype	Number of ewes	Total dry matter yield (kg)	Total dry matter (%)	Total dry matter yield in comparison with the values of Merinos (%)	Total dry matter % in comparison with the values of Merinos (%)
Year I	Low	Langhe F ₁	36	14.02	19.40	116	98
		Sarda F ₁	39	12.69	19.15	105	97
		East-Friesian F ₁	32	15.93	18.79	131	95
		Pleven F ₁	35	12.42	19.49	102	99
		Merino	41	12.13	19.75	100	100
Year II	Low	Langhe F ₁	17	7.99	19.52	133	96
		Sarda F ₁	23	9.96	19.90	166	98
		East-Friesian F ₁	14	11.57	19.39	193	95
		Pleven F ₁	20	8.52	20.28	142	100
		Merino	21	5.99	20.32	100	100
Year III	Low	Langhe F ₁	28	11.48	18.59	131	101
		Sarda F ₁	27	11.13	18.70	127	102
		East-Friesian F ₁	28	12.52	18.28	143	99
		Pleven F ₁	30	10.02	18.49	115	100
		Merino	22	8.75	18.41	100	100
Year I	High	Langhe F ₁	13	17.70	18.24	168	90
		Sarda F ₁	9	14.97	18.07	142	89
		East-Friesian F ₁	9	19.17	18.45	173	91
		Pleven F ₁	17	15.23	18.59	145	92
		Awassi F ₁	4	12.09	18.91	115	94
		Merino	9	10.52	20.21	100	100
Year II	High	Langhe F ₁	14	14.34	19.61	179	94
		Sarda F ₁	11	14.10	18.86	176	91
		East-Friesian F ₁	7	14.13	17.94	176	86
		Pleven F ₁	19	12.38	19.60	155	94
		Awassi F ₁	10	12.06	19.88	151	96
		Merino	6	8.01	20.79	100	100

Regarding these milk components values, the smallest difference were observed in the case of Sarda F₁ ewes under different conditions. Thus for extensive production system this genotype could be suggested.

The results received were similar to those ones published by Kukovics *et al.* (1992, 1993). Regarding the value of milk composition, the Merino was the best variety, but the milk production of this variety was low. That was the reason why it was important to cross it with milk breeds. According the final opinion of the authors, the pre-selection of Merino stock on the bases of milk production should be made independently from the crossbreeding partner.

References

- Jávor, A., Sás, Gy., Veress, L. and Kovács, Z. (1993). The effect of feeding on sheep milk production, In: Proceedings of the 5th International Symposium on Machine Milking of Small Ruminants, Kukovics, S. (ed.), Budapest, Hungary, May 14-20, 1993. *Állattenyésztés és Takarmányozás (Hungarian Journal of Animal Production)*, Supplement 1: 541-546.
- Kukovics, S., Molnár, A., Mohácsi, P., Mérő, Gy. and Ábrahám, M. (1993). Relationship among the milk components and the changes of fat, protein and lactose contents during the lactation. In: Proceedings of the 5th International Symposium on Machine Milking of Small Ruminants, Kukovics, S. (ed.), Budapest, Hungary, May 14-20, 1993. *Állattenyésztés és Takarmányozás (Hungarian Journal of Animal Production)*, Supplement 1: 161-176.
- Kukovics, S., Molnár, A., Mohácsi, P., Mérő, Gy., Ábrahám, M. and Szabados, A. (1992). Comparative valuation of crossbred milk sheep populations. 1st. Paper: Pooled milk production results. *Állattenyésztés és Takarmányozás (Hungarian Journal of Animal Production)*, 41(4): 299-309.
- Kukovics, S., Rákóczi, Gy., Molnár, A., Schusztér, T., Mohácsi, P. and Nagy, A. (1988). Keresztezett juhok tejtermelési jellemzői – elvárások és realitás (Milk production traits of crossbred ewes expectation and reality). In: *A tej, illetve a hús-gyapjú irányú fejlesztés lehetőségei (The possibilities in the development of milk and meat-wool production)*, The Proceedings of National Sheep Breeding Symposium, Kukovics, S. (ed.), pp. 18-36.