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CONTENTS

THE EXAMINATION OF TSIGAI EWE MILK

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ABSTRACT

For their measurements starting in 2005, the authors used the milk of 3 types of Tsigai sheep that are suitable for milking, they examined the milk composition, the possible differences between the milk types, the coagulation characteristics, cheese processing, yielding characteristics and the transfer of solid content into cheese. From the large number of experiment and measurement results, in this article, the results of milk composition examinations are described.

1. INTRODUCTION

At the onset of the spring lactation period, the compound and the individual milk samples were taken from the Lédeci Tsigai sheep to be found in Balmazújváros, Hungary (L), the Erdélyi (red headed) Tsigai sheep (E) – altogether 134 animals – and from the Csókai Tsigai sheep to be found at the Agricultural Centre in Debrecen, Hungary (Cs) – altogether 100 animals. Tsigai species is an old, independent species, an indirect descendant of the Eastern wild sheep. It first appeared in Hungary in the 1700s. The Erdélyi Tsigai, so-called" Covasna" species has reddish-brown face and legs. This is called Rusty Tsigai in Romanian (Jávor, 2006). Most Tsigais have darker face and legs. As an ancient species, the Tsigai has its oestrus period in autumn. Most ewes bear their lamb at the end of winter or the beginning of spring. In Serbia, most Csókai ewes have their lamb on three occasions within two years. On average, they produce 40-60 litres of milk (Kukovics, 2002).

Due to its single use (and to the blood proportion of foreign species), now the Hungarian Sheep Farmers' Association recognises the Lédeci or milking Tsigai sheep as an independent species. The body size of this species is significantly larger than that of the holding, which is currently considered indigenous, and it bears the physical characteristics of outstanding milk-producing ability. The milking version is more prolific than the indigenous one, and the lamb are black when they are born. (Gáspárdy, 2001)

2. MATERIALS AND METHODS

On each occasion we examined the milk of approximately 100 individuals per species. The raw milk samples were collected on the farm site, according to the regulations of the Hungarian MSZ EN ISO 707: 2000 standard, with the help of the farm workers. Both at the Debrecen and Balmazújváros sites, the samples were collected by hand milking. The samples were transported to Szeged chilled. Since ewe milk composition changes during the lactation period (the fat, protein and solid content increases), the samples were collected fortnightly (Fenyvessy, 1999).

The composition of the milk was examined according to IDF Standard 141B: 1996. When examining the milk composition, the samples were heated to 40 ^{0}C in water bath, then the measurement was carried out by means of a Bentley 150 type infra-red spectrophotometer. Determining the milk composition is based on the fact that the dispersed components dissolved in the milk let through or absorb light depending on their quantity. The instrument shines through the sample with light beams of 6 different wavelengths, and the milk composition is calculated by means of the instrument's own software from the light absorption and permeability figures. From the light absorption figures we can determine the fat, the protein, the lactose and the solid content of the milk. The quantity of the fat-free solid material content and mineral content can be calculated on the basis of measurement figures.

Some results of a large number of simultaneous measurements of compound milks heated up to 40 ^{0}C are shown in Table 1, while some of the internal content values of the individual milk samples taken on 27th April 2005 are shown in Table 2, as examples.

Table 1: Composition of milk from Lédeci Erdélyi and Csókai Tsigai sheep as of 3rd March 2005.

	Lédeci		Erdélyi		Csókai	
Fat	5.92	5.91	5.00	5.01	5.36	5.38
Protein	5.04	5.04	4.81	4.81	5.23	5.23
Lactose	5.07	5.08	5.23	5.23	4.95	4.96
Solid content	17.23	17.23	16.24	16.25	16.74	16.77
Total protein	5.23	5.23	5.02	5.02	5.42	5.41
Freezing point (^{0}C)	0.577	0.577	0.573	0.573	0.583	0.584

Table 2: Composition of the individual milk of the Lédeci, Erdélyi and Csókai Tsigai sheep as of 27th April 2005

Traceability ear-badge number	Fat	Protein	Lactose	Solid content	Total protein
L 222	12, 55	7, 69	0, 90	20, 63	7, 62
L 227	5, 95	5, 07	5, 06	17, 22	5, 26
L 0172	9, 64	4, 88	4, 54	19, 95	5, 04
L 9369	4, 97	5, 68	5, 22	17, 04	5, 87
L 23	3, 85	4, 41	5, 14	14, 47	4, 61
L 348	2, 95	5, 91	5, 24	15, 37	6, 10
L 230	2, 81	6, 30	4, 66	14, 96	6, 46
L 245	3, 65	4, 90	5, 53	15, 33	5, 13
L 02746	5, 08	4, 31	4, 47	14, 86	4, 48
L 247	6, 25	4, 60	4, 89	16, 78	4, 78
L 229	3, 42	5, 90	3, 84	14, 23	6, 02
L 244	3, 28	4, 61	5, 18	14, 21	4, 82
L 262	3, 71	4, 42	5, 56	14, 92	4, 65
Mean	*5, 24*	*5, 28*	*4, 63*	*16, 15*	*5, 45*
Standard deviation	*2, 88*	*0, 98*	*1, 22*	*2, 10*	*0, 92*

E 266	6, 59	4, 83	4, 78	17, 29	5, 01
E 272	3, 87	4, 96	5, 27	15, 25	5, 17
E 271	10, 27	4, 61	4, 47	20, 24	4, 76
E 268	5, 84	5, 57	4, 06	16, 42	5, 71
E 269	4, 16	4, 56	4, 94	11, 77	4, 77
E 54	3, 18	4, 93	4, 96	14, 21	5, 12
E 260	3, 19	4, 92	5, 60	14, 95	5, 15
E 279	4, 08	5, 58	5, 12	15, 97	5, 78
E 298	4, 14	5, 92	5, 04	16, 31	6, 11
E 282	2, 58	5, 46	4, 71	13, 88	5, 63
E 283	2, 76	4, 57	5, 02	13, 44	4, 77
E 274	2, 37	5, 77	5, 06	14, 39	5, 96
E 275	2, 28	5, 80	5, 23	14, 57	6, 00
Mean	*4, 25*	*5, 19*	*4, 94*	*15, 28*	*5, 38*
Standard deviation	*2, 22*	*0, 50*	*0, 38*	*2, 08*	*0, 50*

For Figure 1, the data of Table 3 were used. The table shows the fat, the total protein and the lactose content of the three types of Tsigai milk examined in 2005.

Table 3: The fat, the total protein and the lactose content of the different Tsigai milk from different genotypes (2005)

Traceability ear-badge number	Fat	Total protein	Lactose
Cs 23352	3, 14	4, 48	5, 24
Cs 33912	2, 24	4, 58	5, 14
Cs 33854	2, 00	4, 56	5, 03
Cs 23483	3, 09	4, 87	4, 89
Cs 13499	3, 11	4, 77	5, 21
Mean	*2, 72*	*4, 65*	*5, 10*
Standard deviation	*0, 55*	*0, 16*	*0, 14*
E 272	3, 25	5, 17	5, 21
E 260	3, 19	5, 15	5, 23
E 298	3, 14	5, 44	5, 04
E 283	2, 76	4, 37	5, 02
E 275	2, 28	5, 00	5, 23
Mean	*2, 92*	*5, 03*	*5, 15*
Standard deviation	*0, 41*	*0, 40*	*0, 11*
L 26	5, 64	4, 75	5, 01
L 246	4, 13	4, 44	5, 09
L 822	4, 15	5, 40	5, 08
L 348	2, 95	5, 10	5, 04
Mean	*4, 22*	*4, 92*	*5, 06*
Standard deviation	*1, 10*	*0, 42*	*0, 04*

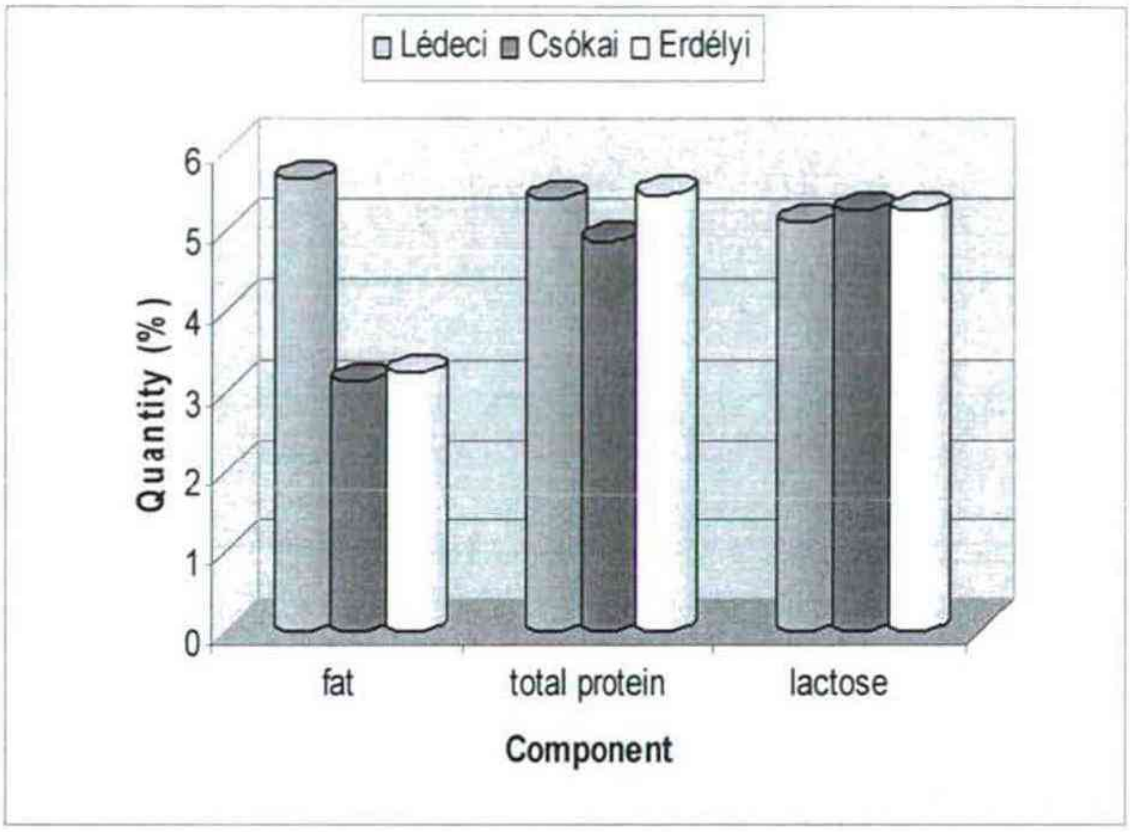

Figure 1: The fat, the protein and the lactose content of the different Tsigai milk (2005)

In the case of the Lédeci species, the fat, the protein and the lactose content was approximately 6.0% (5.64%, 5.40% and 5.09 % respectively). It is important to note the low fat content of the Csókai and the Erdélyi Tsigai milk. In the case of the Csókai species, the fat content was 3.14%, while in the case of the Erdélyi type, it was 3.25%; the Lédeci milk's fat content was a high 5.64% value, as normal for ewe milk.

We encountered smaller differences when comparing protein contents. The Csókai species' milk had the lowest protein content of 4.87%, while the protein content of the Erdélyi species' milk measured 5.44%. The smallest difference can be observed when measuring the lactose content, the difference between the lowest and the highest value was only 0.15. The lactose content of the Erdélyi and the Csókai milk were somewhat higher than the figures published in the professional literature.
In the same year, the solid material and the fat content were also examined in the case of the three species.

Table 4: The solid material content of the different Tsigai species' milk (2005)

Traceability ear-badge number	Solid material content
Cs 23352	16, 18
Cs 33912	15, 12
Cs 33854	14, 95
Cs 23483	14, 76
Cs 13499	14, 23
Mean	*15, 05*
Standard deviation	*0, 72*
E 272	13, 25
E 260	13, 95
E 298	13, 31
E 283	13, 44
E 275	14, 90
Mean	*13, 77*
Standard deviation	*0, 69*
L 26	17, 02
L 246	14, 54
L 822	17, 07
L 348	15, 37
Mean	*16, 00*
Standard deviation	*1, 25*

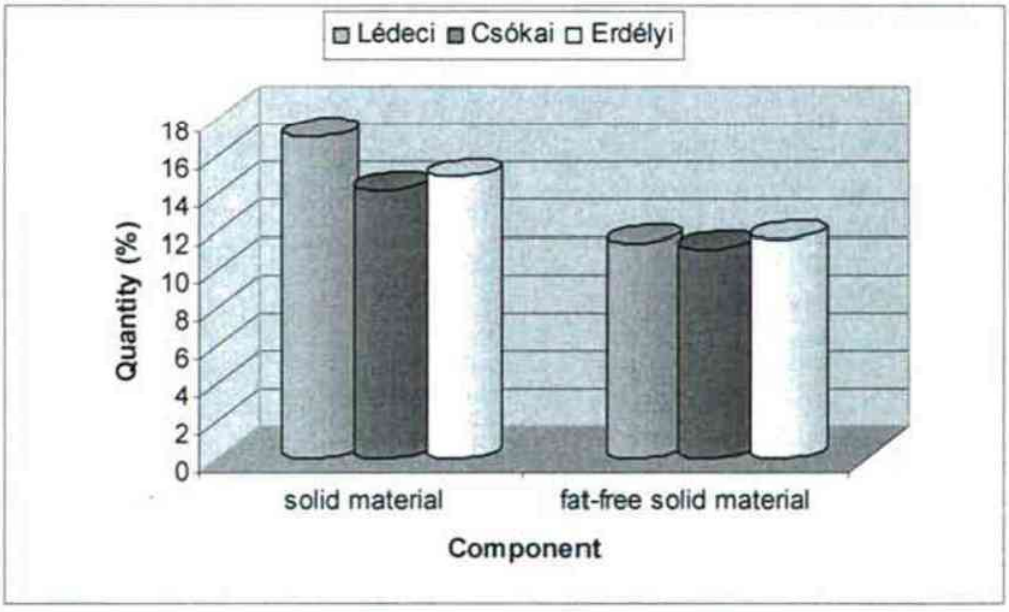

Figure 2: The solid material and the fat-free solid material content of the different Tsigai species' milk (2005)

The solid material content was the highest in the Lédeci species' milk (17.07%) and the lowest in the compound milk of the Csókai Tsigai sheep (14.23%). The fat-free solid material content was approximately equal in all the three milk (on average 11.39%).

3. CONCLUSION

If we compare the measured and calculated results, we can conclude that while certain internal characteristics (fat and solid material content) show quite significant differences depending on the type, the protein and lactose content values do not differ remarkably. Since we are only at an early point in processing the results, our task will be now to explore the mathematical multi-variable function relations between these characteristics, and the impact these parameters make on processing, milk coagulation and the characteristics of the final product.

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