Morphology of udder and milkability of ewes of Tsigai, Improved Valachian, Lacaune breeds and their crosses

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Summary

During the milking period 2002 - 2004 we evaluated morphology of udder and milkability of ewes (583 observations with each trait) in ewes of 8 genotypes (286 ewes) created of the basis of Tsigai (T), Improved Valachian (IV) and Lacaune (LC) breeds. All studied parameters were influenced by the genotype (P<0.001), many of them also by the effect of parity. Linear assessment (9 points scale) and exact measures of udder showed that ewes of T and IV breeds had smaller udder, with smaller cisterns and better teat position than ewes of LC breed. Portion of machine stripping (PMS) was the best in IV ewes (26.0 %) out of the purebred breeds, then in T ewes (27.2 %) and the highest with purebred IV ewes (36.3 %). The highest portion of milk milked within 30 and 60 seconds out of total milk yield was in ewes of T, then with machine milk (r = 0.296 and/or 0.314) as well as with total milk yield (r = 0.465 and/or 0.518; P<0.001). PMS was significantly influenced by size of teat (r = 0.177 and/or 0.113; P<0.001) and it was depend on udder attachment (r = -0.205; P<0.001) and general udder shape (r =-0141; P<0.001).

Key words: *Ewe, udder morphology, linear assessment, milkability*

Introduction

In Slovakia Lacaune breed is used in a relatively large scope in breeding of native milk breeds (Tsigai, Improved Valachian, Merinos). The intention is to improve mainly milk production in the created crosses and to keep good functional and morphological properties of udder at the same time. Convenient subsidiary selection traits are being looked for that could be used in sheep breeding for better milkability and udder morphology suitable for machine milking. This way of milking develops favourably in Slovakia during recent years. Works of Marie-Etancelin et al. (2001), Serrano et al. (2002), Casu et al. (2002) is obvious that it is possible to use with success traits of linear evaluation of udder in breeding of milk sheep. The objective of this work was to analyse selected traits of linear assessment of udder and milkability of ewes of Tsigai, Improved Valachian, Lacaune breeds and their crosses, and to find out to which extent depend the selected traits of milk production and milkability on morphology of udder.

Material and methods

We determined the morphology of udder in ewes of 3 purebred breeds (Tsigai – T, Improved Valachian – IV and Lacaune – LC) and 5 types of crosses created on the basis of them (number of ewes = 286; some ewes were measured several times) during the milking period 2002 – 2004. We evaluated following traits on a 9 points linear scale: udder depth (UD-LA), depth of cistern (DC-LA), teat position (TP-LA), teat size (TS-LA), udder cleft (UC-LA), udder attachment (UA-LA) and general shape of udder (GSU-LA). We measured: udder depth (UD – mm), depth of cistern (DC – mm), length of teat (VC – mm) and angle of teat (PC – degree) by means of measuring tape and protractor. We recorded also selected parameters that characterize milk yield and milkability of ewes in individual control measurements. We studied the following parameters (in ml): amount of milk milked by machine within 30 and 60 seconds (MY30S; MY60S); machine milk yield (MM), machine stripping (MS), total milk yield (TMY), and percentage portion of machine stripping (PMS), portion of MY30S out of TMY (PMY30S) and portion of MY60S out of TMY (PMY60S). To analyse primary data of all variables (583 measurements with each parameter) we used the linear model with fixed effects; we took into consideration the factor genotype (8 levels), parity (3 levels), control year*period of milking (6 levels) and DIM as covariable. Partial correlation coefficients were calculated on residuals after the data adjustment by the mentioned linear model of covariance analysis. Statistical package of SAS programmes (SAS/STAT, 1999-2001), GLM and CORR procedures were used for calculation.

Results

All studied parameters (tab. 1) were highly significantly influenced by the factor genotype ($P<0.001$). Most parameters were significantly influenced also by the effect of parity. Ewes in 3rd lactation had according to linear assesment significantly larger udder depth (5.57 points), depth of cistern (5.32 p.), larger teats (4.90 p.) and more horizontal position of teats (5.48 p.) than ewes in 1st lactation (4.51; 4.89; 4.27 respectively; $P<0.05$ to 0.001). Ewes in 1st lactation had better milk ejection (on the basis of amount and portion of milk milked within 30 and 60 seconds) and lower PMS than ewes in 3rd lactation ($P<0.01$ to 0.001). Comparison of purebred ewes of T, IV and LC breeds showed the greatest udder depth in LC ewes (UD-LA = 6.19), followed by IV (4.55) and the lowest depth was in ewes of T breed (3.68; tab. 1). Differences were highly significant ($P<0.001$). On the other hand, the worst teat position was in LC ewes (TP-LA = 5.76), followed by IV ewes (4.58) and the best position was with T ewes (4.52). Differences between T and LC ewes were highly significant (P<0.001). As regards the size of teats, it was significantly larger in IV ewes (TS-LA = 4.94) than in LC (4.50) and T ewes (4.14; P<0.001). Crosses IV x LC and T x LC with 50 and 75 % genetic portion had larger udders, larger cistern in udder at the same time, however, worse teat position. LC ewes had the highest TMY (536.4 ml; tab. 1) but only the 4th best MM (355.8 ml). However, it was higher than with purebred T (210.9 ml) and IV ewes (305.0 ml). Out of purebred breeds was portion of machine stripping the best in IV ewes (26.0 %), then in T ewes (27.2 %) and the highest in purebred IV ewes (36.3 %). The highest portion of milk milked within 30 and 60 seconds out of TMY was in T ewes (64.5 and 72.6 %, respectively), then IV (58.1 and 73.6 %, resp.) and the lowest one in LC ewes (45.2 and 62.0 %, resp.).

Table 2 shows that udder depth is in highly significant correlation with machine milk (r = 0.296 and/or 0.314) as well as total milk yield (r = 0.465 and/or 0.518; P<0.001) and with milk amount milked within 30 and 60 seconds as well. Portion of machine stripping is highly significantly influenced by teat size (r = 0.177 and/or 0.113; P<0.001). The larger the teat was the higher was the portion of machine stripping. Teat position did not influence PMS in our experiment. By contrast, both milk yield (MM, TMY) and milkability (MY30s, MY60s, PMS) were highly significantly dependent (tab. 2) on udder attachment and on general teat shape (P<0.001). The better was teat attachment the lower was PMS (r = -0.205; P<0.001) and the better was evaluation of general udder shape the lower was PMS (r= -0.141; P<0.001).

Conclution

Our results show that improvement of native breeds T and IV using the LC breed increases not only the size of udder but also milk production (MM and TMY) in the created crosses. However, mainly teat position deteriorates in connection with cisterns of udder growing larger. Traits related to milkability (PMS, PMY30s, PMY60s) are slightly worse in crosses than in purebred T and IV ewes, the worst being in LC breed. From the said follows that in Slovakia it will be necessary to use also data from linear assessment of udder (mainly UD, TS, UA and TP) in breeding of milk sheep.

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Table 1. Estimates of mean values (LSM) of selected morphological and functional traits of udder in sheep in dependence on their genotype.

Trait	Genotype							
	IV	IVxLC (37,5% LC)	IVxLC (50% LC)	IVxLC (75% LC)	T	TxLC (50% LC)	TxLC (75% LC)	LC
UD-LA	4,55	4,37	5,76	5,76	3,68	5,18	4,86	6,19
UD-mm	13,70	14,10	17,46	16,96	12,22	15,05	15,22	18,52
DC-LA	4,08	4,65	5,76	5,13	4,11	5,82	5,43	5,98
DC-mm	1,91	2,16	3,50	2,94	1,59	2,91	2,33	3,36
TP-LA	4,58	4,83	5,60	5,49	4,52	5,95	5,18	5,76
TP-st.	40,99	42,65	45,79	45,94	40,06	50,51	41,95	46,27
VC-LA	4,94	5,15	4,66	4,68	4,14	4,54	4,35	4,50
TS-mm	3,73	3,75	3,50	3,56	3,38	3,39	3,63	3,47
UC-LA	5,07	5,08	5,58	4,83	4,82	4,99	3,82	4,32
UA-LA	5,61	5,83	5,64	5,71	4,95	5,49	4,86	5,33
GSU-LA	5,24	5,67	5,83	5,89	4,15	5,68	5,34	5,73
MY30S	231,7	194,6	240,09	230,70	183,7	233,1	220,2	243,7
MY60S	305,0	273,1	351,4	343,4	210,9	288,7	321,6	345,0
MM	307,1	279,7	378,4	371,3	211,2	302,2	361,1	355,8
MS	100,3	107,8	136,5	130,5	79,4	114,9	95,2	180,5
TMY	407,4	387,6	514,8	501,8	290,6	417,1	456,3	536,4
PMS	26,0	35,7	27,5	28,8	27,2	28,2	23,5	36,3
PMY30S	58,1	45,8	49,2	46,6	64,5	58,4	51,0	45,2
PMY60S	73,6	63,3	68,4	66,8	72,6	70,0	71,1	62,0

Table 2. *Residual correlations among traits of milkability and linear assessment and measures of udder in sheep.*

Trait	MY30S	MY60S	MM	MS	TMY	PMS	PMY30S	PMY60S
UD-LA	0,227+++	0,251+++	0,296+++	0,355+++	0,465+++	0,052ns	-0,115++	-0,116++
UD-mm	0,182+++	0,265+++	0,314+++	0,429+++	0,518+++	0,079ns	-0,186+++	-0,145+++
DC-LA	0,148+++	0,156+++	0,153+++	0,77ns	0,184+++	-0,058ns	0,022ns	0,055ns
DC-mm	0,184+++	0,219+++	0,206+++	0,184+++	0,289+++	-0,028ns	-0,013ns	0,034ns
TP-LA	0,067ns	0,191+	0,094+	0,095+	0,139+++	-0,003ns	-0,043ns	-0,008ns
TP-st.	0,063ns	0,035ns	0,031ns	0,066ns	0,064ns	-0,019ns	0,034ns	0,016ns
TS-LA	0,125++	-0,137+++	-0,128++	0,134++	-0,049ns	0,177+++	-0,113++	-0,174+++
TS-mm	-0,95+	-0,148+++	-0,144+++	0,52ns	-0,107++	0,113++	-0,009ns	-0,106+
UC-LA	0,074ns	0,088+	0,079ns	-0,009ns	0,069ns	-0,057ns	0,032ns	0,062ns
UA-LA	0,345+++	0,363+++	0,334+++	-0,033ns	0,296+++	-0,205+++	0,124++	0,213+++
GSU-LA	0,402+++	0,396+++	0,383+++	0,114++	0,419+++	-0,141+++	0,095+	0,134++