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INFLUENCE OF SOME FACTORS ON THE UDDER MEASUREMENTS IN AWASSI SHEEP AND ITS CROSSBREEDS WITH DOMESTIC POPULATION SHEEP IN MACEDONIA

UTJECAJ NEKIH ČIMBENIKA NA POJEDINE DIMENZIJE VIMENA OVCE AWASSI I NJEZINIH KRIŽANACA S DOMAĆOM POPULACIJOM OVACA U MAKEDONIJI

N. Pacinovski

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SUMMARY

The average values of individual udder dimensions were determined in three populations sheep: domestic population i.e. ovcepolian sheep, awassi sheep and F_1 crossbreeds between awassi and domestic population. The influence of several factors on the udder dimensions is shown in parallel in the three populations.

Regarding the statistical analysis, besides the basic statistics, all the data were analyzed by multi trait fixed model. The separate trait influence was studied by the F-test, and the differences between LS – estimates of each effect were determined by the T-test. The analyses were made by the set of programs SPSS.

The genotype had a highly significant influence ($P<0,001$) on the udder measurements in the three tested populations, while the lactation in order (age) and lactation month had an influence on some of the udder measures.

The determined increase in certain dimensions i.e. udder measurements, in the F_1 crossbreeds point to a positive effect of crossbreeding awassi and domestic population sheep, which has to result on higher milk production.

Key words: udder, udder measures, awassi sheep, F_1 crossbreeds, domestic population, factors influence (genotype, age, month, month of lactation).

INTRODUCTION

The udder represents an exceptionally important segment in the selection assessment of every sheep. In fact, in making a direct choice of a sheep, the first impression of a good dairy sheep comes from the udder. The udder type and size have a significant effect on milk production that point to the conclusion that genotypes with higher milk production have a bigger and better type of udder (Kukovics et al., 1999). According to the same

Dr. sc. Nikola Pacinovsk, i University “Ss. Cyril and Methodius“, Institute of Animal Science, Bul. Ilinden 92a, p. box. 207, 1000, Skopje, Republic of Macedonia.

authors, increase in the udder size and its type increases milk production. Under the selection influence the form, volume and other udder characteristics constantly change (Tjankov et al., 2000). Having in mind the fact that sheep milk production is a complex physiological and biochemical process, a lot of factors as the following have an influence: constitution, live weight, age, number of lambs, lambing season, feeding, temperature etc., an experiment was made in the study to determine the influence on several factors, on the udder dimensions in domestic population sheep, awassi breed and its F_1 crossbreeds, gained from crossbreeding of awassi and domestic population sheep in R. Macedonia.

MATERIAL AND METHODS

Material of experimentation were three populations sheep of: domestic population i.e. ovcepolian sheep, awassi sheep and F_1 crossbreeds between awassi and domestic population. The average values of individual udder measurements in the tested sheep were gained through determining the genotype influence, lactation and month of lactation.

Testing was done on the total of 49 domestic population sheep, 45 awassi sheep and 46 F_1 generation crossbreeds between awassi and domestic population. According to the age, the domestic population sheep were in the second to seventh lactation, awassi sheep from the first to the eleventh, while all the F_1 crossbreeds were in the second lactation.

The udder dimensions in the sheep from the same breed were measured before and after milking, while F_1 generation and domestic population sheep measured just before milking, regardless of the udder size, which was measured before and after milking in these two groups.

The following external udder measurements were taken with a ribbon in cm:

- Udder basal volume (BV);
- Udder volume (UV)
- Front udder depth (FUD)
- Udder depth (UD)
- Side udder width (SUW)
- Rear udder width (RUW)
- Breast volume (BV);
- Udder height (UH);
- Breast length (BL)
- Breast distance (BD)

For comparing the data, these external udder characteristics were measured one per year, i.e. during lactation in early May.

Regarding the statistical analysis, the measured udder dimensions were analyzed by appropriate multi trait fixed model:

$$Y= \mu+Gi+Lj+Mk+eijk$$

where:

Y – is individual observation of each dimension, i.e. udder measurement during the test-control (udder basal volume, udder volume, front udder depth, udder depth, side udder width, rear udder width, breast volume, udder height, breast height, breast distance)

μ – is common, mutual average of tested characteristics;

Gi – effect of the i-th genotype with (i = 1 – awassi, 2 – domestic population, 3 – F_1 crossbreeds);

Lj – effect of j-th lactation with (j = 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 – awassi, 2, 3, 4, 5, 6, 7 – domestic population);

Mk – effect of k-th lactation month with (j = 1, 2, 3, 4 – awasi, 2, 3, 4 – domestic population, 3, 4 - F1 crossbreeds);

ejklm – residual influence

The separate effects characteristic influence was studied by the F-test, and the differences between LS – estimates of each effect were determined by the T-test.

The analyses were made by the set of programs SPSS.

RESULTS AND DISCUSSION

Certain factors influence the udder dimensions

According to Table 1 data, the genotype has a highly significant influence (P<0,001), on all the udder measurements, in the three tested populations.

Table 1. Several factors influence the udder dimensions on the tested populations, F-test and its significance (F- statistics)

Tablica 1. Nekoliko faktora utjecaja na dimenzije vimena testiranih populacija, F-test i njegova važnost (F-statistika)

Dimension Dimenzija	Factor - Faktor			R^2 - Determination coefficient Koeficijent determinacije
	Genotype Genotip	Lactation Laktacija	Lactation month Mjesec laktacije	
BV1	39.52***	3.236**	1.177^{ns}	0.553
BV2	1579.34***	3.866***	6.585***	0.981
UV1	78.24***	1.816^{ns}	2.275^{ns}	0.710
UV2	81.49***	0.947^{ns}	3.405*	0.710
FUD1	127.75***	0.405^{ns}	2.334^{ns}	0.796
FUD2	1127.96***	6.839***	7.841***	0.974
UD1	111.09***	1.823^{ns}	4.243**	0.782
UD2	1847.25***	8.535***	9.791***	0.782
SUW1	105.942***	1.310^{ns}	3.057*	0.735
SUW2	828.215***	2.009^{ns}	2.392^{ns}	0.964
RUW1	78.865***	1.521^{ns}	1.601^{ns}	0.689
RUW2	1101.61***	1.106^{ns}	0.461^{ns}	0.974
BV1	292.09***	1.626^{ns}	0.709^{ns}	0.915
BV2	772.99***	1.230^{ns}	5.088**	0.964
UH1	47.77***	1.123^{ns}	2.739*	0.692
UH2	2866.28***	2.752*	4.581**	0.990
BL1	19.38***	2.727*	1.328^{ns}	0.459
BL2	1206.45***	4.199***	2.319^{ns}	0.977
BD1	65.69***	1.611^{ns}	2.342^{ns}	0.656
BD2	2024.74***	3.262**	2.137^{ns}	0.986
Df	2	7	3	

ns – P>0,05, * - P<0,05, ** - P<0,01, *** - P<0,001

The lactation influence in the three populations in order is highly significant (P<0,001), on the udder basal volume, before and after milking, the front udder depth after milking, udder depth after milking and on the teats length and distance after milking. This factor shows a significant influence (P<0,05) on the udder height after milking, as well as on the teats length before milking. This factor does not manifest influence (P>0,05) on the other udder measurements.

The month of lactation had a highly significant influence (P<0,001) on the udder basal volume, the front udder depth, the teats volume and the udder height, all after milking. It also had a highly significant influence (P<0,001) on the udder depth before and after milking also. This factor manifested a significant influence (P<0,05) on the udder volume after milking, as well as on the mean udder width and height before milking. This factor did not show influence on the other udder measurements.

Genotype influence on the udder measurements in the three populations

According to Table 2 data, on the udder dimensions, awassi sheep had the highest values, and those of domestic population had the lowest. Only regarding the teats volume, the domestic population sheep had insignificantly higher value compared to F_1 crossbreeds. For instance, the udder basal volume before milking, in awassi sheep was 40.61 cm, and in domestic sheep 30.92 cm. The minimal and maximal value of this dimension in the stated populations was from 27 to 55 cm in awassi and 21 to 40 cm in domestic population. In F_1 crossbreeds it was 31.94 cm. The minimum and maximum of this measure are 20 to 42 cm.

Seker et al., (2004) determined close results to ours, regarding the udder dimensions in awassi sheep of the same breed, according to which the udder height, depth and volume, the teats length, diameter and distance are 28, 14.4, 40.7, 4.2, 2.3 and 16.1 cm, respectively. In our researches the values regarding all the stated measurements are higher by 1-2 cm, exept the udder depth, where we determined lower value (14 cm). Only in the teats volume we determined value higher by 4 cm, regarding the one noticed by Seker et al., (2004). In

Table 2. Genotype influence on the udder measurements
Tablica 2. Utjecaj genotipa na dimenzije vimena

Dimension Dimenzija	Genotype - Genotip		
	Awasi, cm Awassi, cm (n = 45)	Domestic population, cm, Domaća populacija, cm (n = 49)	F_1 crossbreeds, cm Križanci F_1, cm (n=46)
BV1	40.61±0.71	30.92±0.68	31.94±0.71
BV2	34.24±0.40	/	/
UV1	42.66±0.63	29.58±0.61	31.16±0.63
UV2	34.46±0.48	24.55±0.46	25.13±0.47
FUD1	13.92±0.24	6.91±0.23	8.00±0.24
FUD2	12.28±0.18	/	/
UD1	22.04±0.35	13.39±0.33	14.16±0.34
UD2	19.46±0.23	/	/
SUW1	22.74±0.43	13.51±0.41	14.13±0.42
SUW2	19.03±0.28	/	/
RUW1	23.23±0.36	16.00±0.35	16.73±0.36
RUW2	19.19±0.23	/	/
BV1	5.94±0.10	1.60±0.09	1.59±0.10
BV2	5.74±0.10	/	/
UH1	28.39±0.38	35.61±0.36	35.94±0.37
UH2	29.40±0.24	/	/
BL1	3.68±0.07	2.82±0.07	2.94±0.07
BL2	4.11±0.05	/	/
BD1	18.16±0.24	13.71±0.23	14.46±0.23
BD2	16.08±0.15	/	/

comparison with our researches, the same authors determined higher values regarding almost all the measurements, in awassi and east Frisian crossbreeds. Only the teats volume in our researches was higher in these crossbreeds. Fernandez et al., (1999) determined results close to ours, regarding the domestic population and F_1 crossbreeds, in sheep of the Koridal breed, according to which the values for udder depth, height, width and volume in this breed were: 13.48, 12.45, 11.80 and 42.55 cm, while the teats length was 3.12 cm.

Lactation influence on the udder measurements in the three populations

Having in mind the fact that lactation in order (age), has a significant influence in the tested sheep population only on certain number dimensions of the udder (Table 1), in awassi sheep most measurements had higher values in the second, third and fifth lactation. In domestic population the highest values for these dimensions were obtained in those in the second and the third lactation, with few exceptions (Table 3).

Table 3. Lactation influence on the udder measurements
Tablica 3. Utjecaj laktacije na dimenzije vimena

Dimension Dimenzija	Awassi - Awassi						
	Lactation - Lakatcija						
	1	2	3	5	6	7	10
n	14	8	7	4	2	8	2
BV1	39.69±1.72	40.26±2.14	39.85±2.41	45.73±3.15	41.86±4.50	39.37±2.17	26.68±4.44
BV2	34.04±1.25	33.27±1.56	31.89±1.75	37.54±2.30	32.06±3.28	33.32±1.58	25.69±3.23
UV1	42.11±1.53	42.70±1.89	42.23±2.13	45.53±2.79	42.20±3.99	43.16±1.92	34.17±3.93
UV2	32.71±1.19	32.84±1.48	33.19±1.67	37.39±2.18	35.46±3.12	34.70±1.50	30.43±3.07
FUD1	13.99±0.62	13.78±0.77	14.18±0.87	13.56±1.13	12.66±1.62	14.17±0.78	15.25±1.60
FUD2	11.42±0.55	11.83±0.68	11.56±0.77	12.49±1.00	12.18±1.43	12.98±0.69	16.32±1.41
UD1	20.65±0.70	21.83±0.87	21.60±0.98	22.18±1.29	22.07±1.84	23.18±0.88	24.34±1.81
UD2	18.42±0.67	18.81±0.83	18.97±0.93	19.95±1.22	19.32±1.74	18.89±0.84	25.82±1.71
SUW1	20.69±1.20	23.72±1.49	22.96±1.68	22.29±2.20	23.64±3.14	23.59±1.51	21.02±3.09
SUW2	17.88±1.00	18.56±1.24	19.96±1.40	19.47±1.83	18.83±2.61	20.67±1.26	19.62±2.58
RUW1	22.01±1.02	24.04±1.26	22.28±1.42	22.31±1.86	26.00±2.66	23.97±1.28	19.42±2.62
RUW2	18.33±0.84	18.05±1.05	20.34±1.18	20.22±1.54	20.01±2.21	19.21±1.06	19.34±2.17
BV1	6.03±0.33	5.63±0.41	5.47±0.46	6.02±0.60	4.72±0.85	6.58±0.41	5.83±0.84
BV2	5.72±0.30	5.27±0.37	5.66±0.42	5.82±0.55	5.65±0.78	6.10±0.38	6.44±0.77
UH1	27.69±0.78	30.07±0.97	26.42±1.09	28.04±1.43	26.80±2.04	27.25±0.99	24.91±2.01
UH2	28.79±0.77	31.09±0.95	27.75±1.07	29.95±1.41	27.13±2.01	27.64±0.97	26.64±1.98
BL1	3.74±0.17	3.68±0.21	3.21±0.23	3.94±0.30	3.09±0.43	3.94±0.21	4.49±0.43
BL2	4.04±0.17	3.81±0.20	4.10±0.23	4.40±0.30	3.96±0.43	4.55±0.21	4.95±0.42
BD1	17.24±0.54	17.64±0.67	17.72±0.76	18.35±0.99	17.63±1.42	19.31±0.68	18.22±1.40
BD2	15.22±0.51	15.03±0.63	16.45±0.71	16.82±0.94	15.73±1.34	17.15±0.64	16.61±1.32

Nastavak tablice na sljedećoj stranici

Nastavak tablice s prethodne stranice

Dimension Dimenzija	Domestic population - Domaća populacija					
	Lactation - Laktacija					
	2	3	4	5	6	7
n	20	4	7	8	6	4
BV1	32.62±1.19	31.10±2.12	28.52±1.74	31.51±1.64	32.05±1.82	29.50±1.95
UV1	31.30±1.12	29.23±2.00	28.33±1.64	30.58±1.55	30.65±1.71	29.79±1.83
UV2	25.40±0.76	23.97±1.35	24.92±1.11	24.29±1.05	25.18±1.16	26.22±1.24
FUD1	7.41±0.41	5.58±0.72	6.70±0.59	7.18±0.56	6.67±0.62	6.26±0.66
UD1	14.36±0.71	13.56±1.26	13.23±1.04	13.08±0.98	13.31±1.09	14.39±1.16
SUW1	12.77±0.73	13.75±1.30	11.92±1.07	13.34±1.01	12.87±1.12	12.24±1.19
RUW1	15.89±0.58	14.89±1.03	15.27±0.85	16.15±0.80	16.18±0.88	16.04±0.95
BV1	1.72±0.10	1.85±0.17	1.64±0.14	1.56±0.13	1.58±0.15	1.60±0.16
UH1	34.72±0.59	36.52±1.04	37.27±0.86	35.29±0.81	36.89±0.90	35.73±0.96
BL1	2.74±0.12	2.99±0.22	3.11±0.18	2.63±0.17	2.76±0.19	3.29±0.20
BD1	13.72±0.41	13.42±0.72	14.03±0.59	13.49±0.56	13.63±0.62	14.59±0.66

Since the age had an influence only on a few udder dimensions in the tested populations, the data are in accordance with the testing of Dag and Zülkadir (2004), whereby the age does not influence any of the udder characteristics in awassi sheep. Anyway, since in our researches the highest values of individual udder measurements were determined in the second, third and fifth lactations in awassi sheep and in the second and third lactations in domestic population of sheep, it does not mean that the values for the udder dimensions are obtained after the second lactation. According to Mroczkowski and Borys (1999), in udder selection of sheep, the age of the sheep should be considered, for reasons that most objective results for the dimensions can be gained with the second lactation.

Lactation month influence on the udder dimensions in the three populations

The influence was determined only on some udder dimensions in the month, i.e. the lactation phase in which the measurement was taken (Table 1). However, the highest values in measured dimensions were determined in the second and third lactation month in awasi sheep and those in domestic population. In F_1 crossbreeds the highest values in measured dimensions were determined in the third month (Table 4).

Table 4. Lactation month influence on the udder measurements
Tablica 4. Utjecaj laktacije na dimenzije vimena

Dimension Dimenzija	Awassi - awassi			
	Lactation month - Mjesec laktacije			
	1	2	3	4
n	3	15	16	11
BV1	35.96±3.56	40.38±1.78	40.21±1.73	39.71±1.96
BV2	28.67±2.59	32.85±1.29	34.67±1.26	33.98±1.43

Nastavak tablice na sljedećoj stranici

Nastavak tablice s prethodne stranice

Dimension Dimenzija	Awassi - awassi			
	Lactation month - Mjesec laktacije			
	1	2	3	4
n	3	15	16	11
UV1	40.74±3.15	40.56±1.58	43.59±1.53	42.03±1.74
UV2	30.40±2.46	34.39±1.23	35.62±1.20	34.86±1.36
FUD1	13.96±1.28	12.94±0.64	14.33±0.62	14.53±0.70
FUD2	11.94±1.13	11.86±0.57	13.42±0.55	13.50±0.62
UD1	21.38±1.45	21.43±0.71	23.55±0.71	22.69±0.80
UD2	18.32±1.37	19.20±0.69	20.62±0.67	21.96±0.76
SUW1	21.06±2.48	21.54±1.24	24.21±1.20	23.42±1.36
SUW2	19.08±2.07	18.17±1.03	19.43±1.00	20.46±1.14
RUW1	21.52±2.10	22.94±1.05	24.12±1.02	22.86±1.16
RUW2	18.83±1.74	19.52±0.87	19.74±0.85	19.35±0.96
BV1	5.51±0.68	5.67±0.34	5.81±0.33	6.03±0.37
BV2	5.78±0.62	5.37±0.31	6.18±0.30	5.91±0.34
UH1	24.64±1.62	28.90±0.81	27.93±0.79	27.77±0.89
UH2	25.92±1.59	29.28±0.79	29.45±0.77	29.05±0.87
BL1	3.77±0.34	3.49±0.17	3.75±0.17	3.89±0.19
BL2	4.46±0.34	4.06±0.17	4.21±0.17	4.30±0.19
BD1	16.95±0.12	17.80±0.56	18.68±0.54	18.63±0.62
BD2	15.51±1.06	16.04±0.53	16.38±0.51	16.66±0.58
Dimension Dimenzija	Domestic population - Domaća populacija			
	Month of lactation - Mjesec laktacije			
	2	3	4	
n	2	13	34	
BV1	31.83±2.82	30.58±1.12	30.24±0.74	
UV1	30.94±2.66	30.39±1.05	28.61±0.70	
UV2	25.69±1.80	25.16±0.71	24.14±0.47	
FUD1	6.30±0.96	7.21±0.38	6.39±0.25	
UD1	13.78±1.68	14.43±0.67	12.76±0.44	
SUW1	11.06±1.73	13.81±0.69	13.58±0.46	
RUW1	14.77±1.37	16.77±0.54	15.67±0.36	
BV1	1.75±0.23	1.66±0.09	1.56±0.06	
UH1	36.85±1.39	35.01±0.55	36.34±0.37	
BL1	2.90±0.29	2.99±0.11	2.87±0.08	
BD1	13.41±0.96	14.54±0.38	13.49±0.25	

Nastavak tablice na sljedećoj stranici

Nastavak tablice s prethodne stranice

Dimension Dimenzija	F_1 crossbreeds - Križanci F_1	
	Month of lactation - Mjesec laktacije	
	3	4
n	2	44
BV1	36.00±2.83	31.75±0.60
UV1	34.00±2.58	31.03±0.55
UV2	27.50±2.01	25.02±0.43
FUD1	9.00±1.10	7.96±0.23
UD1	16.00±1.52	14.08±0.32
SUW1	13.00±1.25	14.18±0.27
RUW1	17.00±1.25	16.72±0.27
BV1	1.80±0.18	1.58±0.04
UH1	32.00±1.82	36.11±0.39
BL1	3.00±0.34	2.93±0.07
BD1	13.50±1.08	14.50±0.23

CONCLUSIONS

Based on the results of these researches done on domestic population of sheep, awassi breed and F_1 crossbreeds, gained with the crossbreed between the two previous populations, the following conclusions can be made:

1. Regarding all the udder dimensions, awassi sheep had statistically higher values ($P<0,01$), in comparison with the other two populations.

2. The genotype had a highly significant influence ($P<0,001$) on the udder dimensions in the three tested populations, while the lactation (age) and lactation month influenced on some of the udder dimensions.

3. According to the results obtained on influence determination of the lactation phase on the udder dimensions, most objective values for the udder exterior from the selection point could be obtained from the second to fourth lactation month.

4. In F_1 crossbreds certain increase in several udder dimensions was observed, that must result in higher milk production.

5. Generally, crossbreeding between the awassi breed and the domestic population of sheep gave significant results.

REFERENCES

1. Dag, B., Zülkadir U. (2004): Relationships among udder traits and milk production in unimproved Awassi sheep. Journal of Animal and Veterinary Advances. Vol. 3, No 11, p. 730-735.
2. Fernandez, G., Farias, D., Lopez, M., Silveira, C. (1999): Genetic improvement in milkability of the Corriedale breed: Morphological study of udder traits. Milking and milk production of dairy sheep and goats. EAAP Publication No. 95.
3. Kukovics, S., Gal, S., Molnar, A., Abraham, M. (1999): The udder traits and the milk yields of different sheep genotype. Milking and milk production of dairy sheep and goats. EAAP Publication No. 95.
4. Mroczkowski, S., Borys, B. (1999): The morphology of the udder and milk quantity and quality in the milking hybrid ewes F1 East-Friesian x Polish Merino. Milking and milk production of dairy sheep and goats. EAAP Publication No. 95.
5. Seker, I., Kul, S., Bayraktar, M., Akcan, A. (2004): Effects of crossbreeding East-Friesian with Awassi Ewes on milk production and mammary gland traits. Medycyna Weterynaryjna, Vol. 60 (8), p. 815-818
6. SPSS. (1994): SPSS 6.1 for Windows Student Version. Chicago, USA.
7. Tjankov, S., Dimitrov, I., Stankov, I., Slavov, R., Panaiotov. (2000): Ovcevodstvo i kozevodstvo. Stara Zagora.

SAŽETAK

Prosječne vrijednosti pojedinih dimenzija vimena određivane su u tri populacije domaće ovce tj. ovcepoljske ovce, awassi ovce i F_1 križanaca awassi i domaće populacije. Utjecaj nekih faktora prikazan je uporedo s dimenzijama vimena u tri populacije.

Što se tiče statističke analize, osim osnovne statistike, svi su podaci analizirani fiksnim modelom mješovitih značajki. Posebni utjecaj značajke istraživan je F-testom, a razlike između LS procjena svakog djelovanja određene su T-testom. Analize su rađene pomoću paketa programa SPSS.

Genotip je imao visoko značajan utjecaj ($P<0.001$) na dimenzije vimena u tri testirane populacije, dok su laktacija u redu (dob) i mjesec laktacije utjecali na neke dimenzije vimena ali nisu utjecali na ostale.

Određeno povećanje nekih dimenzija tj. mjera vimena u križanaca F_1 upućuje na pozitivno djelovanje križanja ovce awassi i domaće populacije, što mora rezultirati većom proizvodnjom mlijeka.

Ključne riječi: Vime, dimenzije vimena, awassi ovca, križanci F_1, domaća populacija, faktori utjecaja (genotip, dob, mjesec, mjesec laktacije)