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INTERRELATION BETWEEN BODY WEIGHTS OF SIRE, DAM AND THEIR LAMBS AT EARLY STAGE OF GROWTH

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Abstract: Records of female lambs and their parents of the Mis sheep breed have used. All animals are approximately have weaned at 90 days of age. Descriptive statistics, paired sample test, paired differences, measures of association, correlations and regression of body weights between female lambs and their parents have done. A complementary least body weights at 30 days and weaning between dams and lambs but utmost weight at 30 days, the lambs were higher while at weaning, the dams had higher weight. It can observe that the averages on body weights the rams were the highest, followed by lambs and the lowest the dams' body weights. The coefficient of determination of R^2 varies from low to high, indicating that the lamb's body weight has more influenced by other factors that we have not considered.There were significant correlations between lamb body weight at birth and sire/dam body weight at birth. The results showed highly significant correlations of lamb's body weight at 30 days with dams but with sires, positive and very low. There had positive but no significant correlation between lamb body weight at weaning and sire body weight at weaning. Lamb body weight at weaning and dam body weight at weaning are highly correlated.

Key words: sire, dam, lambs, body weight, birth, weaning, early stage growth, association, correlation

Introduction

In sheep selection, it is very imperative to get the right information about the quality of future parents at an early age *(Petrović et al., 2018).* "Progeny test" lasts a long result about the value of the parents we get when several years pass. In this regard, it is important to find out the relationship between the body development characteristics of parents at an early age, and the growth traits of their offspring. This research so far has not received much attention. The lamb's body weight at different ages has a deterministic outcome on the expediency of sheep production enterprises *(Mokhtari et al.*, 2013). As well, bodyweight is one of the relevant selection criteria for the enhancement of meat animals such as sheep *(Afolayan et al., 2006).* The phenotypic information of both parents can approximately predict how the offspring will perform. However, the observed performance of each animal in each trait is the result of the heredity that it receives from both parents, and the environment in which it raised and even when an attempt is made to provide a uniform environment, there are still accidental and unknown environmental differences between animals *(Babar et al., 2004).* The live weight considered most important to monitor in animals since it serves as an indicator to accurately meet it uses either the purpose of reproduction and or market specifications. The meat production primary parameter is body weights and has influenced by genetic and environmental factors *(Aksoy et al., 2016).* Body weights also help or even to guide breeders to determine the ideal management practices to maintain the gain at an optimum level *(Lalit et al., 2016)*. Weight information could also use in determining the value of animals and the efficiency of rearing *(Shirzeyli et al., 2013).*The body weights reflect the phenotypic characteristics of the animals; it's a source for standard determination of certain breed. It has a major role to accomplish profitable effects *(Petrović et al., 2015).* The success of genetic improvement has based on expectations that the descendants by their phenotypic values will be above the average values of parents *(Caro Petrovic et al., 2018).* The body weight and growth performance is an important character which determines the overall productivity of the flock and the economic return from sheep production enterprises with the main objective for meat production *(Yiheyis et al., 2012; Zidane et al., 2015; Caro Petrovic et al., 2017*).

The study aimed to determine associations/correlations of sires, dams' body weights at an early stage of growth with their female lambs. This paper is to shed light on this issue of great importance in sheep science and practice.

Material and Methods

The study pertained to the early growth of the Mis sheep breed of the Institute for Animal Husbandry, Belgrade-Zemun, Serbia. The collected records of 100 female lambs and their parents have used. The animals are approximately have weaned at 90 days of age. All the animals have the same feeding and housing management and have reared intensively. The sires and dams have conditioned before the premating. The dams feeding and management during the gestation period treated uniformly. Bodyweight controls of the lambs have performed at birth, at 30 and 90 days of age. The statistical analysis of body weights of sires (4) at birth (PBWB), at 30 days (PBW30), at weaning (PBWW); dams (100) at birth MBWB, at 30 days MBW30, at weaning (MBWW), and their female lambs (100) at birth (LBWB), at 30 days (LBW30), at weaning (LBWW) performed using SPSS software package program on the following: Descriptive statistics, paired sample test, paired differences and measures of association, correlations and regression of body weights between female lambs and their parents.

Results and Discussion

The sires, dams, and their lamb's body weights at different early growth stages regardless, of their birth type, have presented in the table below.

Table 1. Means, Standard Deviation, Variance of body weights (sires, dams and their female lambs)

Traits	Minimum	Maximum	Mean	St. Error	Std. Deviation	Variance
PBWB	5.30	6.30	5.9250	.03917	.39167	.153
MBWB	2.80	6.50	4.3390	.07914	.79135	.626
LBWB	2.60	6.50	4.4560	.09055	.90546	.820
PBW30	16.00	19.00	18.0000	.12309	1.23091	1.515
MBW30	10.00	19.00	13.3330	.18463	1.84627	3.409
LBW30	10.00	20.50	13.6400	.22969	2.29686	5.276
PWW	26.00	35.00	31.0000	.34082	3.40825	11.616
MWW	20.00	34.00	23.6480	.24420	2.44195	5.963
LWW	20.00	32.00	24.1520	.28135	2.81348	7.916

It is known that ewe size, pregnancy nutrition and pregnancy rank are known to affect the productive performance of ewes and their offspring (*Petrovic et al., 2013*). In can notice (table 1) that dams and lambs showed a similar minimum body weight at 30 days and weaning. On the other hand, at the maximum weight at 30 days, the lambs were higher for 1.50 kg while in weaning weight, the dams higher for 2 kg. It can observe that the averages on body weights the rams were the highest, followed by lambs and the lowest the dams' body weights. We can see that the body weight of lambs is moving within normal limits for this population *(Petrovic, 2006; Caro Petrovic et al., 2013).*

In Table 2, the degree of relationship of the observed samples in the population has estimated.

Table 2. Measures of Association of lambs body weights between lambs and sires; lambs and dams

Traits	R	R Squared	Eta	Eta Squared
LBWB * PBWB	.204	.042	.224	.050
LBWB * MBWB	.481	.231	.680	.463
LBW30 * PBW30	.099	.010	.119	.014
LBW30 * MBW30	.353	.124	.646	.417
LWW * PWW	.127	.016	.191	.037
LWW * MWW	.315	.099	.621	.386

The results of the performed analysis show that the estimated regression model for testing the influence of parents' body weight at an early age expressed by the coefficient of determination of R^2 varies from 1.0% - LBW30 * PBW30 to 23.1% - LBWB * MBWB. In the context of this analysis, this indicates that the weight of the lamb's body has more influenced by other factors that we have not considered.

Eta Squared- η^2 is the proportion of total variance that could attribute to the influence of the observed factor. From the table we can see that the values of this parameter range from .014- LBW30 * PBW30 to .463- LBWB * MBWB. With this, it means that the influences related to the body weight of the lambs in the table ranged from small to very large.

Aman et al. (2013) have used a nonlinear regression model to predict lamb body weight. He obtained high values of the coefficient of determination of R^2.

Other authors like *Lambe et al. (2008)* have utilized exponential models and linear regression models for growth analysis of two breeds of lambs from birth to slaughter.

Table 3. Paired Samples Test of Differences of body weights (lamb vs. rams; lamb vs. dams)

		Paired Differences			t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean			
Pair 1	LBWB – PBWB	-1.46900	.91007	.09101	-16.142	99	.000
Pair 2	LBWB – MBWB	.11700	.87005	.08700	1.345	99	.182
Pair 3	LBW30 - PBW30	-4.36000	2.49622	.24962	-17.466	99	.000
Pair 4	LBW30 - MBW30	.30700	2.38574	.23857	1.287	99	.201
Pair 5	LWW – PWW	-6.84800	4.13369	.41337	-16.566	99	.000
Pair 6	LWW – MWW	.50400	3.09048	.30905	1.631	99	.106

The paired samples test of body weights differences (Table 3) was highly significant (P<0,01) on body weights between lambs vs. sires from birth weight to their weaning weight (LBWB-PBWB; LBW30-PBW30; LWW-PWW while between lambs vs. dams had no significant differences (P>0,05) in tested body weights.

Table 4. Correlations of lambs body weight at birth with sires and with dams

		LBWB	PBWB	MBWB
LBWB	Pearson Correlation	1	.204*	.481**
	Sig. (2-tailed)		.041	.000
	Sum of Squares and Cross-products	81.166	7.180	34.112
	Covariance	.820	.073	.345
	N	100	100	100
PBWB	Pearson Correlation	.204*	1	.011
	Sig. (2-tailed)	.041		.917
	Sum of Squares and Cross-products	7.180	15.188	.322
	Covariance	.073	.153	.003
	N	100	100	100
MBWB	Pearson Correlation	.481**	.011	1
	Sig. (2-tailed)	.000	.917	
	Sum of Squares and Cross-products	34.112	.322	61.998
	Covariance	.345	.003	.626
	N	100	100	100

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

Table 4 shows significant correlations (P<0.05) between lamb body weight at birth (LBWB) and sire body weight at birth (PBWB) (P<0.01) between lamb body weight at birth (LBWB) and dam body weight at birth (MBWB).

Table 5. Correlations of lambs body weight at 30 days with sires and with dams

		LBW30	PBW30	MBW30
LBW30	Pearson Correlation	1	.099	.353**
	Sig. (2-tailed)		.327	.000
	Sum of Squares and Cross-products	522.280	27.700	148.128
	Covariance	5.276	.280	1.496
	N	100	100	100
PBW30	Pearson Correlation	.099	1	-.068
	Sig. (2-tailed)	.327		.504
	Sum of Squares and Cross-products	27.700	150.000	-15.200
	Covariance	.280	1.515	-.154
	N	100	100	100
MBW30	Pearson Correlation	.353**	-.068	1
	Sig. (2-tailed)	.000	.504	
	Sum of Squares and Cross-products	148.128	-15.200	337.461
	Covariance	1.496	-.154	3.409
	N	100	100	100

** Correlation is significant at the 0.01 level (2-tailed).

The results showed correlations highly significance of lambs body weight at 30 days with dams (Table 5) with sires, positive and very low correlations.

Table 6. Correlations of lambs body weight at weaning with sires and with dams

		LWW	PWW	MWW
LWW	Pearson Correlation	1	.127	.315**
	Sig. (2-tailed)		.206	.001
	Sum of Squares and Cross-products	783.650	121.000	214.220
	Covariance	7.916	1.222	2.164
	N	100	100	100
PWW	Pearson Correlation	.127	1	.072
	Sig. (2-tailed)	.206		.474
	Sum of Squares and Cross-products	121.000	1150.000	59.600
	Covariance	1.222	11.616	.602
	N	100	100	100
MWW	Pearson Correlation	.315**	.072	1
	Sig. (2-tailed)	.001	.474	
	Sum of Squares and Cross-products	214.220	59.600	590.350
	Covariance	2.164	.602	5.963
	N	100	100	100

** Correlation is significant at the 0.01 level (2-tailed).

In table 6, it showed positive but no significant correlation between lamb body weight at weaning (LWW) and sire body weight at weaning (PWW). On the other hand, between lamb body weight at weaning (LWW) and dam body weight at weaning (MWW) have shown very significant correlations. Interesting research of *Matika et al. (2001)* that may be related to ours is that lamb weight at birth has a mean genetic correlation with maternal weight. Furthermore, these authors stated correlations between birth weight and other weights to 18 months were high (0.75-0.85). Total weight of lamb weaned was moderately correlated to birth weight (r_g = 0.46 ± 0.15) but tended to be highly correlated with 18 month weight (0.92 ± 0.10) and ewe weights (0.75 ± 0.09-0.91 ±0.07).

Ali et al. (2006) stated that correlation and regression coefficients between the above mentioned two traits were 0.37 and 0.025 ± 0.0001, respectively. Analysis of variance of dam age at service and birth weight of lambs due to regression revealed that this regression was statistically significant ($P<0.01$).
Ghafouri et al. (2008) informed that genetic correlations among growth traits of Mehraban sheep were positive, indicating that selection for WW would also increase BW and other weights.

Studies of the relationship between the body weight of lambs have been examined by other authors (*El Fadili, 2000; Bromley, 2001),* in different sheep population with the results on the existence and importance of examining the interrelation of weight for selection in sheep breeding.

Conclusion

Our research has shown that there is a significant association between lamb weight and their parents. The results showed correlations of high significance with regards to the body weight of lambs over 30 days compared with mothers and low in comparison with fathers. There was a positive but not significant correlation between lamb body weight at weaning and father body weight at weaning. The body weight of lambs at weaning and the weight of mothers at weaning are strongly and closely related. The coefficient of determination of R^2 varies from low to high, indicating that the lamb's body weight has more influenced by other factors that we have not considered. These studies are rare in the literature and have great practical relevance for the selection of future breeding sheep at an early age, which is an eternal goal in breeding domestic animals.

Interrelacija između mase tela očeva, majki i njihovih jagnjadi u ranom stadijumu telesnog razvoja

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Rezime

Istraživanja su obavljena kod ženke jagnjadi i njihovih roditelja u populaciji ovaca rase Mis. Sve životinje su odbijene u starosti od 90 dana. Ispitivane su komparativne mase telesnog razvoja jagnjadi i njihovih roditelja, da bi se ustanovila eventualna povezanost, a u cilju efikasnije selekcije u ranom uzrastu jedinki. Analiza je obuhvatila pored mase od rođenja do zalučenja, korelacije i regresiju mase između jagnjadi i njihovih roditelja. Majke i jagnjad su imali sličnu minimalnu telesnu masu sa 30 dana i pri odbijanju, ali maksimalna masa jagnjadi sa 30 dana bila je veća dok su kod odbijanja majke imale veću težinu. Može se primetiti da su prosečni telesni parametri ovnova bili veći, u poređenju sa masom jagnjadi, ali manji u komparaciji sa masom tela u razvojnom uzrastu majki. Koeficijent determinacije R^2 varira od niskog do visokog, što ukazuje da na masu tela više utiču drugi faktori koje nismo razmatrali. Postoje značajne korelacije između telesne mase janjadi pri rođenju i mase tela ovnova, ali i ovaca majki pri njihovom rođenju. Rezultati su pokazali korelacije visokog značaja u pogledu telesne mase jagnjadi tokom 30 dana u poređenju sa majkama i niskog stepena u komparaciji sa očevima. Postoji pozitivna, ali ne značajna korelacije između telesne mase jagnjadi pri odbijanju i mase tela očeva prilikom njihovog odbijanja.

Mase tela jagnjadi pri odbijanju i mase majki pri odbijanju su jako i pozitivno povezane. Ova istraživanja su retka i škrta u literaturi, ali imaju veliki praktični značaj za selekciju budućih priplodnih ovaca u ranom uzrastu, što je večiti cilj u oplemenjivanju domaćih životinja.

Ključne reči: mužjak, ženka, jagnjad, telesna masa, rođenje, zalučenje, rani porast, povezanost, korelacija

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