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GENETIC EVALUATION AND RELATIONSHIPS BETWEEN LAMS WEIGHT AND BODY WEIGHT IN KURDI SHEEP

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ABSTRACT

This study was carried out at the private field Jezhnikan village, Erbil, Kurdistan region, Iraq, on (101) ewes (245) records and (5)rams of different ages and weights over the period April(2018) until May(2020), in order to study the genetic evaluation and relationship between lams weight and ewe's weights at matting, birth and milking in Kurdi sheep. The results showed that the overall mean of birth weight (BW) and weaning weight (WW) 4.243 kg and 23.231kg, respectively. It has been shown that the years of birth significantly affected (P≤0.05) on birth weight birth, the weight recorded in this study were, (4.207 kg and 4.318) kg ewes lambed during 2019 and 2020 respectively. The effect was significant (p ≤0.05) for the sex and type of birth in birth weight and weaning weight. However Month of birth and age of dam had non-significant effect on (BW) and (WW). The heritability estimate of (BW) and (WW) was found to be (0.21) and (0.13) respectively. The genetic correlation between (BW) and (WW) were 0.68 highly and significant (P≤0.05) however low and significant (P≤0.05) with ewes weight at (mating, birth and milking) were 0.15, 0.14 and 0.15 respectively, breeding value of rams ranged between-0.113to 0.065 and -0.048to 0.263for (BW) and (WW) respectively, we concluded that most of breeding value and non-genetic factors had important effect of (BW) and (WW).

Keywords: Kurdi sheep lams weight, genetic and non-genetic relationship.

Introduction

Kurdi is the native sheep breed in Iraqi north region, rams and ewes are characterized as they have no horns, and their body is longitudinal with shorter legs than Awassi, average rams weight is between 80-100kg and ewes are between 60-70kg, it reared to produce meat, milk and wool (Alkass, 1993). Birth weight is the first observed trait in life of an animal on which growth, production and reproduction traits are dependent. (Thiruvenkadan *et al*., 2008). Heritability (h^2) of a trait is the proportion of the phenotypic variance for the trait that is due to additive genetic effects. Growth potential of lambs is very important in the sheep production. It is essential to have knowledge of genetic parameters for these economically important criteria to formulate breeding strategies for better production (Gowanea *et al*., 2015). Body weight is the primary parameter in meat production and is influenced by genetic and environmental factors. Sheep live weights and age along with nutrition, weather, and season, has been reported to influence reproductive performance (Akhtar *et al*., 2012). Lambs higher growth rate reflect their ability to produce more milk and meat production at the succeeding periods. Moreover, body weights at different ages are considered a strong indicator of growth that can be used as selection criteria for an early evaluation and selection of the best flock individuals (Falconer, 1989). Repeatability estimate is considered as the upper limit of heritability because it contains the permanent environment effects in addition to genetic and phenotypic variances (Lush, 1945). Both growth and the reproductive traits are important in the determination of economic efficiency of any production system that is why the farmer and/or technician search through selection the best animals that can transmit these characteristics to their progeny (Riofrio *et al*., 2016). Without the right environment the genetic component is hidden and it is not expressed and precisely the characteristics of growth, fertilization and lactation are the most susceptible to environmental influences (Pereira-Campos, 2012).The aim of this study was to examine genetic evaluation and non-genetic relationships between lams weight and body weight in Kurdi sheep.

Material and Methods

This study was carried out at the private field jezhnikan village –Erbil/ Kurdistan region –Iraq, birth and weaning (90 days) weights were record a total of (245) records of Kurdi ewes and (Gowanea *et al*., 2015) rams, lambs were weighed using an electronic scale and ear tagged soon after birth and left to suckle their dams during grazing until weaning at approximately 3 months of age. The ewes were allowed to graze and wheat bran with a supplement of 500-600g concentrate diet composed of barley, straw was offered ad libitum and mineral blocks and clean water were also supplemented during the period of the study, all the animals were vaccinated, dipped and drenched according to the routine program applied for each local flock, A procedure of the statistical analysis system SAS. (2012). was used according to the following linear additive model:

$$Yijkln = \mu + Ai + MBj + Sk + Tl + YEm + eijklnm$$

Where:

yijkln = individual observation of milk production (kg)
μ = general mean, common element to all observations
A_i= fixed effect of the i^{th} age of dam (1, 2, 3 and 4)
MB_j= fixed effect of the j^{th} month of birth (1, 2 and 3)
S_k= fixed effect of the k^{th} sex (1 and 2)
T_l= fixed effect of the l^{th} type of birth (1 and 2)
YE_m= fixed effect of the m^{th} year of birth (1 and 2)
Eijklmn = random error, N (0, δ^2 e)

Tests of significance for the differences between means were carried out according to Duncan (1955).The sire components of variance and covariance from the multivariate analyses were used for the estimation of genetic parameters using the following:

$$h^2 = 4\ \delta^2 d / \delta^2 d + \delta^2 e$$

Where:

δ^2d is the sire component of variance

δ^2e is the environmental component of variance,

Repeatability estimate was obtained as follows:

$$R = \delta^2 d / \delta^2 d + \delta^2 e$$

Where:

R=Repeatability was estimated for birth weight

δ^2d = Variance among ewes

δ^2e = Variance within ewes

Results and Discussion

Birth weight as an early measurable trait is of great interest because of its positive genetic correlation with further live weights. Weaning weight is the most important economic traits determining economic returns from sheep in commercial flocks and both provide examples of traits subject to environmental variation. Table (1) shows overall mean of birth weight and weaning weight (4.243 and 23.231) kg, respectively. The year of birth had significantly (P≤0.05) effect on birth weight (table 1), birth weight recorded in this study were, (4.207 and 4.318) kg ewes lambed during 2019 and 2020 respectively, favorable environmental conditions with good availability of the feed during the gestation period, which might have been contributed to higher live body weight of lambs at birth, however, no significant effect of the year of birth on weaning weight, these findings are agreement with those found by (Gowanea *et al.*, 2015; Momoh *et al*., 2013; Raoof and Balisany, 2017 and Simeonov *et al*., 2015). Month of birth had no significant influence on birth weight and weaning weight, these results are in accordance with those reported by several researchers (Alkass, 1993 and Thiruvenkadan *et al*., 2008) However, the results disagreed with other researchers (Raoof and Balisany, 2017) who reported that month of birth had significant influence on birth weight and weaning weight. Sex of lams had significant effect (P≤0.05) on birth weight and weaning weight, males were heavier weight (4.339 kg) at birth and (23.756 kg) weaning weight than females weight 4.173 kg and 23.155 kg) respectively (Table 1). The effect of sex could be explained by the effect of sex hormones, while estrogen restricting the growth of long bones of body, androgen acts as anabolic hormone. The effect of sexes a result of physiological functions mainly attributed to sex hormones, while estrogen restricting the growth of long bones of the body, androgens acts as anabolic hormone, promoting muscle growth rate (Gowanea *et al*., 2015; Momoh *et al*., 2013; Raoof and Al-sherwani, 2013 and Raoof and Balisany, 2017) reported similar results. Single born lambs were heavier at birth and weaning than twins, they were (4.200) and (4.000) and (23.937, 22.723) kg for single and twin for birth weight and weaning weight respectively (Table 1). may due to the fact that, twin development are competing for the amount of nutritive materials in the mother uterus, and it may attributed to the number of cotyledons. During the post-natal period, they were sharing mother's milk, and therefore each lamb would receive less milk than single reared lambs. (Gowanea *et al*., 2015; Momoh *et al*., 2013 and Raoof and Al-sherwani, 2013) reported similar results. Age of dam had no significant influence on birth weight and weaning weight, however, the results disagreed with other researchers (Raoof, 2007 and Raoof and Al-sherwani, 2013), on Kurdi sheep, Awassi sheep and Mamesh sheep who reported that age of dam had significant influence on birth weight and weaning weight.

Genetic Parameters

The estimates of heritability along BW, WW, are given in (Table 2). The heritability estimates of BW, WW, were (0.21) and (0.13) respectively, suggesting that there is the considerable scope of improvement in these traits by mass selection. Similar results for birth weight were also reported by (Raoof, 2017) who obtained (0.24), but less than at weaning (0.31). (Raoof, 2007) 0.14, 0.18on Hamdani sheep the results of this study appeared that estimated values for heritability for weight at birth, weaning were 0.17, 0.38 respectively. (AL-Khauzai *et al*., 2006). Table (2) presents the genetic correlation between birth weight and weaning weight were (0.68) highly and significant (P≤0.05) however low and significant (P≤0.05) with ewes weight at (mating, birth and milking) were(0.15, 0.14 and 0.15) respectively, but weaning weight of lambs had low the genetic correlation with ewes weights at (mating, birth and milking) were (0.06, 0.10 and 0.08) respectively. The phenotypic correlation obtained between birth weight and weaning weight (0.74), birth weight and weight at mating (0.18) and birth weight and weight at birth (0.18) and birth weight and weight at milking (0.18), however weaning weight had low and non-significant phenotypic correlation obtained with ewes weights at(mating, birth and milking) were (0.10, 0.13 and 0.11) respectively (Table 2). The genetic correlation can be separated from the environmental and it is the genetic correlation that has real practical value for the breeder. The values of breeding value of sires for birth and weaning weights are shown in (Table 3). The breeding value ranged between (-0.113) to (0.065) for birth weight and between (-0.048) to (0.263) for weaning weight, these get acceptable response in birth and weaning weights by selection. The results suggest the importance of the non-genetic factors in birth weight and weaning weights performance of lambs (AL-Khauzai *et al*., 2006). Also, the estimated values for genetic and phenotypic correlations between birth weight and each of weight at weaning were (0.93 these values reveal that selection for total litter weight at weaning should result in genetic improvement in other weight traits.

Table 1 : Non-genetic factors affecting birth and weaning weights in kurdi sheep

traits Factors	No	Birth weight(kg)	Weaning weight(kg)
Overall mean	245	4.243±0.044	23.431±0.311
Year of birth		*	N.S
2019	127	4.207±0.034 b	23.500±0.226 a
2020	118	4.318±0.047 a	23.441±0.314 a
Month of birth		N.S	N.S
December	62	4.218±0.041 a	23.476±0.279 a
January	102	4.268±0.047 a	23.340a0.319 a
February	81	4.295±0.045 a	23.598±0.303 a
Sex		*	*
Male	129	4.339±0.041a	23.756±0.276a
Female	116	4.173±0.038b	23.155±0.251b
Type of birth		*	*
Single	151	4.420±0.032 a	23.937±0.214 a
Twin	94	4.00±0.050 b	22.723±0.332 b
Age of dam(year)		N.S	N.S
2	15	4.133±0.096a	23.033±0.643a
3	43	4.270±0.057a	23.402±0.380a
4	75	4.238±0.040a	23.513±0.273a
5≥	112	4.289±0.035a	23.732±0.231a

Means within column classification followed by different superscript are different significantly * (P≤0.05), N.S: Non-significant

Table 2 : Estimates of heritability (diagonal). Genetic (above diagonal) phenotypic (below diagonal) correlations traits studied in kurdi ewes

	BW	WW	WM	WB	WML
BW	0.21	0.68*	0.15*	0.14*	0.15*
WW	0.74*	0.13	0.06 NS	0.10 NS	0.08 NS
WM	0.08**	0.10 NS	-----		
WB	1.18 **	0.13 NS		-----	
WML	0.18**	0.11 NS			-----

* (P≤0.05), ** (P≤0.01), NS: Non-Significant DMP=Daily Milk Production, BW=Birth Weight, WW=Weaning Weight WM=Weight at Mating, WB= Weight at birth WML=Weight at milking

Table 3: Breading value of sire (Ram) according to birth and weaning weight of Kurdi sheep.

Rank of Sire	No. of Sire	BV of birth weight	Rank of Sire	No. of Sire	BV of weaning weight
1	133	0.065	1	133	0.263
2	132	0.054	2	122	0.096
3	122	0.002	3	126	0.094
4	126	-0.007	4	132	-0.041
5	129	-0.113	5	129	-0.048

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