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GENETIC EVALUATION AND RELATIONSHIPS BETWEEN BODY WEIGHT AND MILK PRODUCTION IN KURDI SHEEP

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ABSTRACT

This study was carried out at the private field Jezhnikan village ,Erbil, Kurdistan region, Iraq. The data set used was (245) records from(101) ewes and (5) sires (rams) of Kurdi sheep over the period April (2018) until May(2020), in order to study the genetic evaluation and non-genetic factors (age of dam, month of lactation, sex, type of birth and year of birth) relationship between ewe's weight at mating ,birth and milking with daily milk production (DMP), total milk production (TMP).The overall mean of the daily milk production (TDM) and total milk production (TMP) (470.90gm)and (45.95kg) respectively. The results showed that the age of dam, Month of lactation, sex and type of birth affected significantly ($p \leq 0.05$) on daily milk production and total milk production, excepted year of birth was non-significant effected on milk production. Ewes aged 4years and 5≥ years 2 year old ewes produced significantly ($P \leq 0.05$) lower (DMP), (386.67gm) than 3year (423.26gm) than 4 years (480.67gm) and 5≥ (493.97 gm.) old ewes. The heritability estimate of (DMP) was found to be (0.13). The repeatability estimate of (DMP) was found to be (0.22).however, the genetic and phenotypic correlation had non-significant effected between milk production and ewes weights at mating, birth and milking, the breeding value of sire (rams)ranged between(-1.194 to1.520),it was concluded that the most of genetic and non-genetic factors showed a significant impact in the performance of Kurdi sheep which requires study and determine the impact of interest and administrative aspects of the herd to increase performance and maximize economic return.

Keywords: Kurdi sheep, milk production, genetic evaluation and breeding value.

Introduction

The Kurdi sheep breed is one of the largest mutton breeds in Iraq, and is widely distributed in Kurdistan Region –Iraq. Kurdi sheep are used mainly for the production of meat, milk, wool, and skin. Milk production has an increasing biological and economical consideration in small ruminant production, locally breeds have low milk production due to their low genetic potential and prevailing environmental conditions like stress caused by harsh environment and different diseases. Milk is a valuable yield obtained from sheep. Although use of sheep milk is generally a tradition especially in Mediterranean countries, it is getting more important in dairy sector because of its high dry matter content (Reiad *et al*., 2010). Heritability (h^2) of a trait is the proportion of the phenotypic variance for the trait that is due to additive genetic effects. The average daily milk production of Iraqi Kurdi sheep was ranged between (317.24-433.93 gm) (Raoof *et al*., 2017). The results of previous studies indicated that sheep influenced by many factors being year and parity (Koncagül *et al*., 2012), birth type (Özder *et al*., 2004), have significant effects on lactation milk production.Body weight is the primary parameter in meat production and is influenced by genetic and environmental factors (Aksoy *et al*., 2016). 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). Environmental factors affecting variability in daily milk production are widely documented in sheep (Ploumi and Emmanouilidis, 1999). Although weight is an important objective in selection so the aim of this study was to examine genetic evaluation and relationships between body weight and milk production in Kurdi sheep.

Materials and Methods

Data on (245) lactation records from (101) Kurdi ewes and (5) sire (rams), collected between (2018) and (2020) at the private field -jezhnikan village –Erbil / Kurdistan region –Iraq, milk production was recorded after 30th days of birth, ewes were weighted at mating, birth and milking and ewes milked by hand and the quantity of morning milk obtained multiplied by (Aksoy *et al*., 2016) to estimate test day milk production, daily milk production. Monthly milk production was calculated by multiply daily milk production by (30days). Total milk production (TMP) was calculated by summing monthly milk production. The sheep were kept, in a semi intensively management, each ewes received 500g of alfalfa with a supplement of 500g concentrate diet composed of mainly barley twice a day (morning and evening), and straw was offered *ad libitum*. Drinking water and salt trace mineral was available, all animals were healthy and clinically free from diseases, a total of (245) records of data were analyses using General Linear Model (GLM) in SAS program SAS (2012) to investigate the effect of some fixed factors on: daily milk production, total milk production in Kurdi sheep according to the following linear model:

$$Eijkln = \mu + Ai + MOj + Sk + Tl + YEm + eijklnm$$

Where:

Eijkln = 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 (2, 3,4and 5≥)

MO_j= fixed effect of the j^{th} month of lactation (1,2and3)

S_k= fixed effect of the k^{th} sex (1and2)

T_l= fixed effect of the t^{th} type of birth (1and2)

YE_m= fixed effect of the j^{th} year of birth (1and2)

Eijkln = random error, N (0, δ^2 e)

Tests of significance for the differences between means were carried out according to Duncan test (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 daily milk production.

δ^2d = Variance among ewes

δ^2e = Variance within ewes

Milk production breeding values for sheep are estimated using the test-day (Oravcová *et al*., 2006).

Results and Discussion

The overall mean of (DMP) and (TMP) were (470.92 gm) and (45.95 kg) respectively (Table 1). Results of the study shown that the age of dam had significantly (P≤0.05) affected daily milk production and total milk production, the higher DMP attained by ewes aged 4 and 5≥ years. 2year old ewes produced significantly (P≤ 0.05) lower (DMP), (386.67 gm) than 3 (423.26 gm) than 4 years (480.67 gm) and 5≥ (493.97 gm.) old ewes (table l), this result could be best attributed to the development and maturity of the mammary gland with the advancement of age till 4 and 5 years and due to the increase of maternal weights as a result of increasing the digestive canal volume (Owen, 1976), may be due to their degree of maturity together with the development of secretary tissue of the udder (Knight and Peaker, 1982), these results were in agreement with (Owen, 1976; Özder *et al.,* 2004 and Raoof, and Al-sherwani, (2013), on the other hand (Jalal *et al*., 2009), showed no significant effect of age of ewes on daily milk production. The month of lactation had significant (P≤0.05) influence on the daily milk production (Table 1). Daily milk production of ewes in February (478.09 gm) was differed significantly (p≤0.05) as compared with January (458.95 gm) and December (475.60 gm). Similar results were reported by (Jalal *et al*., 2016 and Raoof and Balisany, 2016), this result could be attributed to changes in the environmental conditions, particularly in ambient temperature together with the availability of feeds during different lambing months (Alkass, 2009). The ewes with male lams had higher milk production (488.57 gm) than did those with female (451.29 gm) lambs the differences being significant (P≤0.05).This may attributed to the fact that males are usually bigger than females and need higher nutrients, thus induce mothers to produce more quantities of milk, these findings were in agreement with those reported by (Owen,1976; Ploumi and Emmanouilidis,1999 and Raoof and Al-sherwani, 2013) ,and on the other hand (Al-samarai *et al*., 2014 and Jalal *et al*., 2016), showed no significant effect of sex on milk production. Ewes with twins tended to production significantly (P≤0.05) higher amounts of milk than ewes with single lambs, ewes with twins produced more milk (513.30 gm) than the ewes with single (444.54 gm) lambs (Table 1). This may due that twin evacuate the udder and stimulate milk, similar results were reported by (Al-Dabbagh, 2019; Özder *et al*., 2004; Raoof, and Al-sherwani, 2013 and Raoof *et al*., 2017). The year of birth had non-significant effect of (DMP) and (TMP)**.** (table 1) these findings were disagreement with those reported by (Haile1 *et al*., 2017 and Sezenler *et al*., 2016). The reason for that may due to availability of green forages which coincide with the fourth month of lactation.

Repeatability

The repeatability estimate for daily milk production was found to be (0.22), it was near than obtained by (Oramari *et al*., 2012) on Kurdi sheep (0.24) but highly than optioned by (Ahmed, 2010) was (0.09) in Awassi sheep and lower than obtained by (Raoof *et al*.,2017) on Arabi sheep and (Al-Dabbagh, 20193) was 0.31in Awassi sheep (Gootwine *et al*., 2001) reported a repeatability of (0.46) for daily milk production in improved Awassi while a high repeatability coefficient does not mean that the animal will demonstrate the same performance in the next productive seasons; it can predict the subsequent performance of the animal under stable environmental conditions (Mourad, 2001).

Genetic parameters

Estimates of heritability, genetic and phenotypic correlation of daily milk production for Kurdi sheep are presented in (tables 2). The variation in estimates of heritability could be attributed to several factors: such as, method of estimating variance component, size of flock, breed of sheep but generally the estimate of heritability of (DMP) tend to be low (0.13) for flocks under selection. The heritability calculated in this study was high than that determined by (Ahmed, 2010), (010, 0.02 and 0.01), in Improved Awassi, Awassi and Assaf respectively, but lower than the value reported by (Al-Dabbagh, 2019) (0.37). Phenotypic correlations between daily milk production and ewes weight at mating, weight at birth and weight at milking (0.06, 0.07 and 0.06) respectively were very low, the estimates of phenotypic correlation were positive for all the traits. It was non-significant for (DMP), virtually zero this strongly suggests that body weight is not determinant of the volume of milk production similar conclusions had been reached by (Mavrogenis and Papachristoforou, 2000). The breeding value for rams ranged between (-1.194 to1.520), (Table 3), due to lower results for heritability and correlation estimation of Kurdi sheep for milk production, It is concluded that improvement can be achieved through mass selection.

Table 1 : Non-genetic factors affecting daily milk production in kurdi sheep

it Factors	No	Daily milk production	Total milk production
Overall mean	245	470.92±0.280	45.95±1.035
Age of dam(year)		*	*
2	15	386.67±2.898c	38.665±0.776b
3	43	423.26±1.018b	41.436±0.914b
4	75	480.67±0.810a	48.067±1.261a
5≥	112	493.97±0.597a	48.621±2.138a
Month of lactation		*	*
December	83	475.60±0.913b	47. 560±1.014a
January	81	458.95±0.827b	44.728±1.060b
February	81	478.09±0.755a	47.429±0.923a
Sex		*	*
Male	129	488.57±0.483a	47.886±0.919a
Female	116	451.29±0.604b	45.130±0.837b
Type of birth		*	*
Single	151	444.54±0.353b	50.404±1.110a
Twin	94	513.30±0.737a	44.200±0.710b
Year of birth		N.S	N.S
2019	127	464.961±0.549a	46.516±0.750a
2020	118	477.331±0.568a	46.650±1.047a

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

	DMP	WM	WB	WML
DMP	0.13	0.02 NS	0.02 NS	0.04 NS
WM	0.06 NS	----		
WB	0.07 NS		----	
WML	0.06 NS			----

NS: Non-Significant DMP=Daily Milk Production, WM=Weight at Mating, WB= Weight at birth WML=Weight at milking

Table 3 : Breading value of sire (Ram) according to milk production of Kurdi sheep.

Rank of Sire	**No. of sire**	**BV of milk**
1	126	1.520
2	132	0.607
3	129	-0.384
4	122	-0.549
5	133	-1.194

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