A study of body weight traits for Marga sheep in Iraqi Kurdistan Region

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ABSTRACT

This study was carried out in commercial flock of Marga sheep at Perash village, Erbil Kurdistan Region of Iraq to investigate the evaluation and effect of some factors on birth weight (BW), weaning weight (WW), marketing weight (MW), pre-weaning daily gain (pre-WDG), post- weaning daily gain (post-WDG) and average daily gain (ADG). A 73 lambs at birth, 58 lambs at weaning and 50 lambs at marketing age were used in the study. The mean ± SD of BW, WW, MW Pre-WDG, Post-WDG and ADG arrived 3.177 ± 0.591, 20.092 ± 6.305, 33.050 ± 9.366 kg/lamb, 0.187 ± 0.070, 0.145 ± 0.067 and 0.165 ± 0.052 Kg/lamb/ day, respectively. Most of fixed effect have a significant effect on body weight traits in present study. The estimated of BLUP values as breeding value for lambs at BW, WW and MW ranged from -1.1772 to 0.8228, -11.93 to 12.0704 and -32 to 4.5 Kg/lamb, respectively. High-performance group (10%) showed superior values for BW (3.3± 0.48 kg/lamb/ewe), WW (29.4 ± 2.51 kg/lamb/ewe), MW (47.3 ±1.85 kg/lamb/ewe), pre-WDG (0.29 ± 0.01 kg/lamb/day), post-WDG (0.19 ± 0.03 kg/lamb/day) and ADG (0.24 ± 0.01 kg/lamb) compared to low-performance group (20%).These results indicated that there are high genetic variations among Marga lambs for all above studied traits. It means that selection can play a big role in improving body weight traits and increasing breeder's income.

Keywords: Birth Weight, Weaning Weight, Marketing Weight, BLUP.

INTRODUCTION

Small ruminants (sheep and goat) are important investments in Iraq. They play a major role in strengthening the backbone of the rural economy. The Iraqi breed is a type of fat-tailed sheep known for its hardiness and adaptability. This breed is utilized for producing various products, including meat, milk, and wool. The Marga sheep, which are identified by their very short ears, are essentially the same as Hamdani sheep. This distinct ear trait may be due to a genetic mutation, and breeders have actively selected for this characteristic, leading to an increase in both male and female populations. As a result, Marga sheep have become widely found throughout Kurdistan. The Hamdani sheep is a breed that is not particularly well adapted but is utilized for a diverse array of products, including meat, milk, and wool. Moreover, this breed has a potential milk yield of 78.255 kg per lactation a growth rate of 148 g/ day [1] and wool production of 2.159 kg / year. Many studies analyzing the factors affecting

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growth performance in sheep [2,3,4,5 and 6].

Limited studies and information are available on body weight and growth performance of Marga sheep. The present study aimed to study the body weight at different ages of this sheep and find the effect of fixed factors on body weight traits and estimating the Best Linear Unbiased Prediction (BLUP) as breeding value for body weight at birth, weaning and marketing age of Marga lambs to provide breeders with data on how to conduct the selection process and choose the parents of the next generation, excluding animals with poor production, and thus increasing breeders' income

MATERIALS AND METHODS

A total of 70 (2-5 and more years old) Marga ewes exposed to 4 rams for mating in commercial flock at Perash village in Erbil, Kurdistan Region of Iraq. Ewes are allowed to graze natural pastures during summer and spring or stubbles during summer for 8 hours daily. Straw is provided in fall and winter whenever required. All ewes are supplemented with hay and concentrates of a daily allowance in amount of 400 g/ewe/day. During mating period and lactation, a total amount of 500 g/ewe/day of concentrates were offered. 67 ewes lambed out 70 ewes gave 73 lambs at birth, 58 lambs at Weaning (90 days) and 50 lambs at marketing weight (180 days). The lamb's identity at lambing, as well ewe's ID, month of lambing and other relevant information are recorded. Male and female lambs are weighed at birth, weaning and marketing weight.

Statistical analyses:

The PROC GLM (General Linear Model) procedure [7] was utilized to analyses the data for determined the effect of fixed effect on body weight traits, which were fitted in the following model:

$$Y_{ijklm} = \mu + A_i + S_j + T_k + M_i + E_{ijkTm}$$

Where:

Y_{ijklm} = Weights traits of lambs at different ages; μ = Over all mean; Ai = Fixed effect of ewes age (i = 2, 3 ,4 and 5 years old) Sj = Fixed effect of sex of lambs (j = 1, Males and 2, Females); Tk = Fixed effect of Type of birth (k = 1, Single and 2, Twins); Ml= fixed effect of the month of lambing (1 = 1 September, 2 October, 3 November, 4 January, 5 February and 6 April) Eijklm = Random/error effect.

Since Tukey tests are appropriate for comparing least square means with this program, they are utilized to compare means for all qualities under investigation. For genetics evaluation of lambs (High and low production) for various performance traits, Best Linear Unbiased Prediction (BLUP) procedure described by (SAS, 2010) was applied. The model used for this purpose was the Mixed Model (Fixed + Random effects) [7] software. according to the BLUP value for MW: where 10% of lambs for the 1st group (Top Production group), 70% for 2nd group and 20% for 3rd group (low production group). The above Equation was used to analyze the difference among lambs' group after add the groups effect to the equation.

$$Y_{ij} = \mu + G_i + E_{ij}$$

Where:

Y_{ij} = Lambs weight traits.

μ = Over all mean.

G i = Effects of groups (i=1, High Production or i=2, Low production)

E ij = Experiment error.

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RESULTS AND DISCUSSION

Body weights in Marga lambs

Least square means ± SD of BW, WW, MW of the Marga lambs are presented in Table (1). The overall means of BW, WW and MW, were (3.177 ± 0.591 kg/lamb), (20.092 ± 6.305 kg/lamb) and (33.050 ± 9.366 kg/lamb), respectively.

The result showed the ewe age had non-significant effect on BW, WW but had a significant ($p \leq 0.05$) on MW were (34.791 ± 8.851 kg/Lamb) Lambs from ewes with four years old gave heavier weight than lambs from young ewes (Table, 1), [6] claimed that the influences could be due to the differences of the ewe's uterine size and mothering ability of ewes at different ages. These findings are consistent with previous reports in Awassi sheep [8]. But in contrast many researchers said non-significant effect of ewes age on body weight was reported by [4] in Karadi sheep and [9] in Awassi sheep.

Sex of lamb had numerically different but non- significant effect on BW, WW and MW were averaged (3.215 ± 0.600 Kg/lamb), (20.306 ± 6.053 Kg/lambs) and (33.203 ± 9.510 Kg/lamb) respectively, but females were heaver weight than male at all stage (Table, 1), writers asserted that the sex of the lamb had no significant effect on the BW, WW and MW of different sheep breeds.[3] in Mandy sheep and [9] in Awassi sheep.

The type of birth had non- significant effect on BW, but the result showed had a significant ($p \leq 0.05$) effect on WW and MW (Table, 1) were averaged (20.417 ± 6.113Kg/lamb) and (33.706 ± 9.09 Kg/lamb), respectively, single-born lambs had heavier than twin-born lambs, Thesis results agreements with [10,11] in Awassi lambs. [12] in Corriedale sheep and [13] in Lohi sheep reported that single lambs have a higher body weight than twin lambs because they have less competition for milk than twin-born lambs and because twin lambs take up less space in the dam's womb than single lambs do.

The month of lambing did not have a significant effect on BW but had a significant ($p \leq 0.05$) effect on WW and MW, where lambs born at April recorded high body

weight at WW (26.287 ± 4.785Kg/lamb) than lambs born in other month, and lambs born at February gave high body weight at MW (41.571 ± 3.207Kg/lamb) than born in other months (Table, 1). Thesis results may be return to the pastures were easier to access in the spring, lambs born later may be more susceptible to intestinal parasites that flourish in warm weather. Similar results were agreement with present results [14] in Barki sheep,[15] in Awassi lambs and [16]. But in contrast many researchers said had non-significant effect months of lamb on body weight [4] and [9].

Daily gains in Marga lambs

The overall mean ± SD for daily gain of the lamb was present in table (2). The pre-weaning daily gain (pre-WDG) from birth to weaning and post- weaning daily gain (post-WDG) from weaning to marketing weight and average daily gain (ADG) averaged (0.187 ± 0.070 kg/ lamb / day), (0.145 ± 0.067 kg/ lamb / day) and (0.165 ± 0.052 kg/ lamb/ day), respectively.

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Table 1. Least square means ± SD for body weight traits in Marga lambs.

Factors	No	Birth weight (Kg/Lamb)	No.	Weaning weight (Kg/Lamb)	No.	Marketing weight (Kg/Lamb)
Overall mean	73	3.177 ± 0.591	58	20.092 ± 6.305	50	33.050 ± 9.366
Ewe age(year)		NS		NS		*
2	17	3.035 ± 0.520 a	11	19.590 ± 6.718 a	9	28.555 ± 9.567 b
3	14	3.107 ± 0.594 a	12	20.250 ± 6.800 a	10	32.550 ± 10.843
4	33	3.237 ± 0.599 a	27	20.679 ± 6.390 a	24	ab
5 and more	9	3.333 ± 0.707 a	8	18.562 ± 5.519 a	7	34.791 ± 8.851 a
						33.571 ± 8.638 a
Sex of lamb		NS		NS		NS
Female	42	3.215 ± 0.600 a	37	20.306 ± 6.053 a	32	33.203 ± 9.510 a
Male	31	3.125 ± 0.584 a	21	19.714 ± 6.863 b	18	32.777 ± 9.371 a
Type of the birth		NS		*		*
Single	67	3.180 ± 0.582 a	54	20.417 ± 6.113 a	46	33.706 ± 9.090 a
Twin	6	3.141 ± 0.739 a	4	15.700 ± 8.211 a	4	25.500 ± 10.535 b
Month of lambing		NS		*		*
September	6	3.325 ± 0.815 a	3	11.266 ± 3.035 c	3	20.000 ± 6.244 c
October	23	3.217 ± 0.496 a	21	17.597 ± 4.041 b	18	26.277 ± 5.355 b
November	12	3.333 ± 0.492 a	10	14.800 ± 3.110 bc	8	30.875 ± 8.025 b
January	6	3.333 ± 0.408 a	4	26.250 ± 4.112 a	3	30.000 ± 1.732 a
February	15	3.000 ± 0.626 a	13	25.000 ± 4.725 a	11	42.500 ± 5.268 a
April	11	3.000 ± 0.774 a	7	26.287 ± 4.785 a	7	41.571 ± 3.207 a

* It means there are significant at (P≤0.05), The same letters in same column for each factor mean non-significant difference NS: non-significant difference.

As in table (2) the result showed ewes age had non-significant in pre-WDG but had significant (P≤0.05) on post-WDG, and ADG were averaged (0.160 ± 0.069 kg/lamb/day) and (0.174 ± 0.049 kg/lamb/day), respectively of lambs from ewes 4 years' old which graves higher daily gain than the lambs born from other ewes. These results were agreement with [8] in Awassi sheep breed, but contrast with those reported by [17]. As in table (2) the result showed sex of lambs had non-significant effect on pre-WDG, post-WDG and ADG. Similar results were reported by [4] in Karadi sheep and [9]. But in contrast the significant of sex of lambs on ADG were reported by [18,19 and 20] in Abera sheep and [21].

The results in table (2) showed that the single-born lambs significantly (P≤0.05) gives higher pre-WDG (0.191 ± 0.068 Kg/lamb/day) and ADG (0.169 ± 0.05 Kg/lamb/day) than twin-born lambs. Similar results were reported by [10,11] in Awassi lambs. Single lambs have a higher body

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weight than twin lambs because they have less competition for milk than twin-born lambs and because twin lambs take up less space in the dam's womb than single lambs do [12] in Corriedale sheep and [4] in Lohi sheep.

The pre-WDG of lambs born in April (0.257 ±0 .055 kg/lamb/day) significantly (Table, 2) high than lambs born in other months this may be due to food grazing and nutrition also lambs born in February had a significantly (P≤0.05) higher post-WDG (0.194 ± 0.046 kg/lamb/day) and ADG (0.219 ± 0.029 kg/lamb/day) than other lambs. This may be due to chances in feeding habits at this time of year. Similar results were reported by [15,16] in Iraqi sheep breed. But in contrast non-significant effect month of lamb on daily gains was reported by [4] in Karadi sheep and [9].

BLUP values for body weights in Marga lambs:

There are differences in the variance between the fixed effects on all the traits under study, as shown in above results. To eliminate the influence of the fixed factors and to obtain the estimated breeding value of each animal for selection purposes, a mixed model was used to calculate the BLUP value, a technique for assessing animal performance and obtaining the actual breeding value for each animal under study. The animals were then ranked based on their BLUP values for each trait, and the best animal (10%) was selected to accelerate production in the next generation.

The BLUP values for BW, WW and MW showed in table (3), (4) and (5), respectively. The BLUP value ranged from -1.1772 to 0.8228 kg/lamb for BW, from -11.93 to 12.0704 kg/lamb for WW and from -32 and 4.5kg/lamb for MW. Lambs were selected to be the parents of the next generation based on their marketable weight (BLUP values). After assessing and ranking their BLUP values from highest to lowest, 10% of the males were chosen as parents, while 20% of the animals (Males and Females) with the lowest BLUP values were excluded.

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Table. 2 Least square means ± SD for pre-WDG, post-WDG and ADG in Marga lambs.

Factors	No	Pre-weaning daily gain (Kg/ Lamb/ day)	No.	Post-weaning daily gain (Kg/ Lamb/ day)	Average daily gain (Kg/Lamb/day)
Overall mean	58	0.187 ± 0.070	50	0.145 ± 0.067	0.165 ± 0.052
Ewe age(year)		NS		*	*
2	11	0.183 ± 0.076 a	9	0.100 ± 0.047 b	0.141 ± 0.053 b
3	12	0.190 ± 0.074 a	10	0.142 ± 0.071 ab	0.163 ± 0.061 ab
4	27	0.193 ± 0.071 a	24	0.160 ± 0.069 a	0.174 ± 0.049 a
5 and more	8	0.170 ± 0.056 a	7	0.158 ± 0.063 a	0.168 ± 0.047 a
Sex of lamb		NS		NS	NS
Female	37	0.189 ± 0.067 a	32	0.142 ± 0.070 a	0.166 ± 0.052 a
Male	21	0.184 ± 0.076 a	18	0.152 ± 0.063 a	0.164 ± 0.052 a
Type of the birth		*		NS	*
Single	54	0.191 ± 0.068 a	46	0.149± 0.067 a	0.169 ± 0.050 a
Twin	4	0.139 ± 0.087 b	4	0.108 ± 0.062 a	0.124 ± 0.058 b
Month of lambing		*		*	*
September	3	0.087 ± 0.022 c	3	0.097 ± 0.055 b	0.092 ± 0.033 c
October	21	0.160 ± 0.043 b	18	0.100 ± 0.059 b	0.128 ± 0.030 b
November	10	0.126 ± 0.033 bc	8	0.179 ± 0.065 a	0.152 ± 0.044 b
January	4	0.254 ± 0.049 a	3	0.144 ± 0.029 ab	0.191 ± 0.010 a
February	13	0.244 ± 0.048 a	11	0.194 ± 0.046 a	0.219 ± 0.029 a
April	7	0.257 ±0 .055 a	7	0.169 ± 0.062 ab	0.213 ± 0.014 a

* It means there are significant at (P≤0.05), The same letters in same column for each factor mean non-significant difference NS: non-significant difference.

The remaining 70% from flock (males were also excluded from the selection process), but the females being retained for breeding within the flock. Thesis results were agreements with what reported by [22] in Hamdani sheep and [4] study on market weight in Karadi sheep.

The BLUP values for top 10% of the lambs at MW to be selected as ram lambs ranged from (0 to +4.5 kg/lamb) which mated with female's lamb in 70% group to improvement of body weight traits in the next generation of this breed of sheep.

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Table 3. BLUP values of birth weight (kg/lamb) for Marga lamb

Lamb No.	BLUP	Lamb No.	BLUP	Lamb No.	BLUP	Lamb No.	BLUP	Lamb No.	BLUP
6	0.8228	9	0.3228	63	0.3228	31	-0.1772	1	-0.6772
7	0.8228	11	0.3228	65	0.3228	32	-0.1772	25	-0.6772
8	0.8228	17	0.3228	70	0.3228	35	-0.1772	39	-0.6772
10	0.8228	18	0.3228	12	-0.1772	38	-0.1772	57	-0.6772
19	0.8228	21	0.3228	13	-0.1772	40	-0.1772	67	-0.6772
30	0.8228	33	0.3228	14	-0.1772	43	-0.1772	2	-1.0772
34	0.8228	36	0.3228	15	-0.1772	45	-0.1772	29	-1.1772
37	0.8228	41	0.3228	16	-0.1772	47	-0.1772	49	-1.1772
42	0.8228	44	0.3228	20	-0.1772	48	-0.1772	53	-1.1772
59	0.8228	46	0.3228	22	-0.1772	50	-0.1772	60	-1.1772
66	0.8228	52	0.3228	23	-0.1772	51	-0.1772	64	-1.1772
72	0.8228	55	0.3228	24	-0.1772	54	-0.1772	69	-1.1772
4	0.7728	56	0.3228	26	-0.1772	61	-0.1772	71	-1.1772
3	0.6228	58	0.3228	27	-0.1772	68	-0.1772		
5	0.4228	62	0.3228	28	-0.1772	73	-0.1772		

Table4. BLUP values of weaning weight (kg/lamb) for Marga lambs.

Lamb No.	BLUP	Lamb No.	BLUP	Lamb No.	BLUP	Lamb No.	BLUP
68	12.0704	57	5.0704	19	-1.4296	6	-5.9296
59	11.0704	60	5.0704	37	-1.4296	12	-5.9296
66	11.0704	17	3.0704	18	-1.9296	34	-5.9296
47	10.0704	49	3.0704	27	-1.9296	14	-6.4296
50	10.0704	54	3.0704	22	-2.4296	31	-6.9296
58	10.0704	63	3.0704	30	-2.9296	16	-7.4296
71	10.0704	9	2.5704	7	-3.3796	23	-7.4296
44	9.0704	28	2.5704	15	-3.9296	40	-7.4296
26	7.0704	64	2.0704	32	-3.9296	29	-7.9296
52	7.0704	8	1.5704	51	-3.9296	36	-7.9296
56	7.0704	42	1.0704	53	-3.9296	4	-8.1296
61	7.0704	25	0.07042	13	-4.9296	41	-9.9296
65	6.0704	33	0.07042	20	-4.9296	2	-11.93
45	5.0704	72	0.07042	24	-4.9296		
55	5.0704	21	-0.9296	38	-4.9296		

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The table (6) show the effect of lambs group (Top 10% BLUP value vs. lowest 20% BLUP values) on Lamb Growth and Body Weight Traits. The results show significant differences between the high and low production groups in most growth and body weight traits except in BW there was no significant difference between the two groups. But the high production group had a significantly higher weaning weight (29.4 ± 2.51 kg/lamb) compared to the low production group (14.13 ± 3.75 kg/lamb). Lambs in the high production group also showed a significantly higher marketing weight (47.3 ± 1.85 kg/lamb) than those in the low production group (20 ± 3.36 kg/lamb), (Table, 6). Thesis results were agreements with reported by [23] in Karadi sheep breed, [24] in Salsk sheep breed and by [25] in Iranian Makuie sheep breed. On the other hands, the results in table (6) showed that the high production group significantly higher pre-WDG (0.29 ± 0.01 kg/day) compared to the low production group (0.12 ± 0.03 kg/lamb/day).

Table5. BLUP values of marketing weight (kg/lamb) for Marga lambs.

Lamb No.	BLUP	Group	Lamb No.	BLUP	Group	Lamb No.	BLUB	Group
50	4.5	10%	63	-7	70%	29	-19	
59	1		64	-8		41	-19	
60	1		42	-9		7	-20	
58	0		45	-9		17	-20	
66	0		52	-10		32	-20	
72	0		27	-11		24	-21	
33	-1		40	-13		15	-23	20%
56	-1		51	-13		34	-23	
57	-3		19	-14		36	-23	
53	-5		28	-14		13	-24	
65	-5		20	-15		18	-24	
71	-5		22	-16		16	-25	
37	-6		25	-16		8	-27	
44	-6		38	-16		2	-28	
55	-6		9	-17		4	-31	
68	-6		12	-17		23	-32	
54	-7		6	-19				

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Similarly, post-WDG was significantly higher in the high production group (0.19 ± 0.03 kg/day/lamb) than in the low production group (0.06 ± 0.04 kg/day/lamb). The ADG was significantly greater in the high production group (0.24 ± 0.01 kg/day/lamb) compared to the low production group (0.09 ± 0.01 kg/day/lamb). Thesis results were agreements with [26] in Awassi sheep.

Given the significant differences in most traits (weaning weight, marketing weight, and daily weight gain rates) in favor of lambs with high breeding values compared to lambs with low breeding values, we conclude that lambs with high breeding values possess distinctive genetic structures and alleles for growth and weight traits. Therefore, selecting males to be the fathers of the next generation will positively affect the growth performance of the next generation and thus increase the breeder's profit.

Table 6. Mean ± SD for the effect of lambs group on body weight traits.

Traits Production	No.	Birth weight (Kg/Lamb)	Weaning weight (Kg/Lamb)	Marketing weight (Kg/Lamb)	Pre-weaning daily gain (Kg /Lamb / day)	Post weaning daily gain (Kg /Lamb / day)	Average daily gain (Kg/ Lamb / day)
High	10%	N.S 3.3 ± 0.84 a	* 29.4 ± 2.51 a	* 47.3± 1.85a	* 0.29 ± 0.01 a	* 0.19 ± 0.03 a	* 0.24 ± 0.01 a
Low	20%	3.31 ± 0.60 a	14.13 ± 3.75 b	20 ± 3.36 b	0.12 ± 0.03 b	0.06 ± 0.04 b	0.09 ± 0.01 b

* It means there are significant at (P≤0.05), The same letters in same column for each factor mean non-significant difference NS: non-significant difference.

CONCLUSION

The results of this study indicate that non-genetic factors influence the growth and weight characteristics of lambs. These factors must be considered and adjusted when evaluating the BLUP as a breeding value of animals. Therefore, using a mixed statistical model eliminates the influence of these factors, resulting in accurate BLUP (breeding) values for the traits under study. Consequently, the wide range of BLUP values for growth and weight traits in lambs in this study provides a broad basis for selection and accelerates genetic improvement, ultimately leading to increased production and income for sheep farmers in the region.

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