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HEMATOLOGICAL PROFILE OF AWASSI LAMBS WITH DIFFERENT GROWTH POTENTIAL IN PRE-WEANING PERIOD

Fatima Juma Azgar[1] and Ayhan Kamal Mohammed[2]
[1]Faculty of Veterinary Medicine, Kirkuk University, Iraq
[2]Faculty of Agriculture, Kirkuk University, Iraq
Corresponding author: fatmaasgar5@gmail.com, ayhan@uokirkuk.edu.iq

Abstract

This study was conducted on 16 Awassi lambs born in sheep farm, Faculty of Agriculture, Kirkuk University to investigate the effect of lambs' growth rate and sex in blood prolife. Blood samples collected at 15-days intervals from lambs aged 90–165 days from jugular vein in tubes with EDTA for hematological values determination. Determined hematological values included: total erythrocyte count (TEC); hematocrit (HCT); hemoglobin concentration (Hb); mean corpuscular hemoglobin (MCH); mean corpuscular hemoglobin concentration (MCHC) and total leukocyte count (TLC); in addition to Basophils (BASO); Monocytes (MONO); Lymphocytes (LYM) and Granulose (GRA) percentages. The weaned lambs (day 90) were divided into two groups according to their weaning weight, fast growing (FG, n=9) with 19.15 kg weaning weight and slow growing (SG, n=7) with 9.21 kg weaning weight. Result indicated that Growth rate groups had significant ($P \leq 0.01$) effect in weaning weight (WWT), final weight (FWT), pre and post weaning growth rates (DWG1, DWG2). FG lambs significantly ($P \leq 0.01$) surpassed SG lambs in all above growth traits. Males significantly ($P \leq 0.01$) surpassed females in birth weight. FG lambs significantly ($P \leq 0.01$) surpassed SG lambs in TEC, HCT, MONO and GRA. Phenotypic correlations between growth traits and blood values showed significant ($P \leq 0.05$) positive correlations between TEC and all growth traits while the correlations between HCT, BASO, MONO and GRA with growth traits were positive significant ($P \leq 0.01$). The only negative significant ($P \leq 0.01$) correlations observed between LYM and growth traits.
***Keywords* :** Hematological profile, Growth rate, Correlations, Awassi lambs.

Introduction

Meat production is the main aim of sheep production from Awassi sheep in Iraq. Awassi sheep is the dominant local breed in Iraq as well as in other Middle East countries, Awassi sheep are characterized by high adaptation ability to harsh environments in expense to their production ability. There is urgent need to increase its production capability (meat and milk) through selection and environmental improvement programs. Live weights and growth rates are main components used in any selection program for increasing meat production, so there is need to apply fast and effective selection program using direct and indirect selection methods (Olivier *et al.,* 2001; Snowder 2002). Blood profile is easy to measure and had strong relation with all biological activities (including growth, reproduction and milk yield) within animal body (Abdel-fattah *et al.,* 2013; Alkass and Juma 2005; Singh *et al.,* 2018). This study aimed to investigate the differences in blood profile between fast growing and slow growing Awassi lambs and the opportunity to use blood profile as indirect selection criteria.

Material and Methods

This study conducted at sheep farm, Faculty of agricultural, University of Kirkuk on 16 Awassi lambs. All lambs weighted and numbered within 24 hours after birth and received full suckling period until weaning at 90 days of age. After weaning lambs were offered 2% of their weight concentrate ratio (14 % CP). Blood samples were collected at 15-days intervals at the ages of 90, 105, 120, 135, 150 and 165 days from jugular vein in tubes with EDTA for hematological studies. The hematological values: total erythrocyte count (TEC); hematocrit hemoglobin concentration (HTC); mean corpuscular hemoglobin (MCH); mean corpuscular hemoglobin concentration (MCHC) total leukocyte (TLC) and differential: Basophils (BASO); Monocytes (MONO); Lymphocytes (LYM) and Granulose (GRA) counts determined on blood samples following the methods described by Benjamin 1978. The weaned lambs were divided into two groups according to their weaning weight, fast growing (FG n= 9: 5 males and 4 females 4 lambs) with 19.15 ± 1.32 kg weaning weight and slow growing (SG n= 7: 5 male 5 and 2 female lambs) with 9.21 ± 0.41kg weaning weight.

Data analyzed using the general linear model procedure within SAS software (SAS 2005) applying Anova and Duncan multiple range test (Duncan 1955) according to following linear model.

$$Y_{ijk} = \mu + G_i + S_j + e_{ijk}$$

Y_{ijk} The observation in i^{th} growth group and j^{th} sex.

μ Overall mean.

1 = Fast growing lambs (FG), 2 = Slow growing lambs (SG)

S_j lambs sex effect

where 1= Male, 2 = Female.

e_{ijk} Experimental error (NID 0, δ^2e).

Results

Growth traits represented in table 1, the overall means for growth traits were 4.21, 15.13, 27.56 kg for BWT, WWT and FWT respectively, 121 and 126 g/day for pre and post weaning daily gains. Growth rate groups had non-significant effect in BWT where FS and SG groups shows similar means (4.15 and 4.28); however, in advanced ages till 6.5 months FG lambs significantly ($P \leq 0.01$) surpassed SG lambs at weaning and final weights (19.50 kg vs. 9.50 kg for WWT and 37.16 kg vs. 15.23 kg for FWT), the same trend observed for pre and post weaning growth rates DWG1 and DWG2 (170.50 vs. 58 and 178 vs. 59 g/day respectively). All growth traits were non-significantly affected by lamb's sex except for post weaning growth rate where female lambs significantly (P≤0.05) surpassed the male lambs.

Values of hematological variables are represented in table 2, the overall mean obtained from this study are 10.15 ($\times10^6$/mm^3), 49.7%, 11.44 (g/dl), 14.71 (pg), 21.94 (g/dl), 3.92 ($\times10^3$/mm$^{3)}$, 0.49 %, 1.99 %, 86.51 % and 11.17% For TEC, PCV, Hb, MCH, MCHC, LEC, BASO, MONO, LYM and GRA respectively.

The results indicate significantly (P≤0.01) higher TEC, PCV, MONO and GRA in FG lambs while SG lambs had higher (P≤0.01) LYM than FG lambs. Other blood values were affected non-significantly by lamb's growth rate. The differences between male and female lambs were all non-significant for all blood values.

Correlation coefficients of growth traits with blood parameters are represented in table-3. BWT showed non-significant correlation with all blood values. Significant (P≤0.05) positive correlation of WWT and DWG1 observed with TEC count (0.55, 0.56) and with MONO (0.69, 0.71), and significant (P≤0.01) positive correlation with BASO, MONO and GRA (0.71 and 0.71, 0.69 and 0.71, 0.66 and 0.68 respectively), significant (P<0.01) negative correlation observed with LYM (-0.68 and -0.67). FWT and DWG2 had significant (P≤0.05) correlations with TEC (0.57 and 0.57) and positive significant (P<0.01) correlations with PCV (0.67 and 0.66) BASO (0.71 and 0.71) MONO (0.71 and 0.71) GRA (0.67 and 0.67) respectively, also negative significant (P<0.01) correlations observed between FWT and DWG2 with LYM (-0.69 and -0.69).

Discussion

Growth traits means obtained in this study are similar to what reported by Abdul-Rahman *et al.,* 2011. Mean values of hematological variables in this study are within the normal range reported by other researchers (Jawasrah *et al.,* 2010; Al-Samarai *et al.,* 2017; Al-Autaish 2016; Singh *et al.,* 2018). Our results are in agreement with Singh *et al.* 2018 regarding growth rate effects on TEC, TLC, Hct, MONO and GRA, while it is in disagreement to Singh *et al.,* 2018 regarding growth rate effects on LYM. Hematological characteristics are an important tool that can be used to monitor health status and production abilities in farm animals. Differences in some hematological parameters that were observed between the groups could be attributed to differences in their growth pattern (FS vs. SG). However, the values of blood cell differentials of lambs in the present study are largely in agreement with the earlier reports Norouzian *et al.,* 2010. High RBC counts in lambs of both groups compared to adult values are in agreement with an earlier study Egbe-Nwiyi and Nwaosu 2013 This may be due to release of more RBCs into circulation MCV, MCH, and MCHC are related to individual RBC count and are important parameters for the diagnosis of anemia. Significantly lower RBC count, Hb concentration, along with significantly higher MCH, indicated an anemic condition in SG lambs. An increase in MCH in SG lambs compared to FG lambs could have resulted from a greater degeneration of RBCs Acharya *et al.,* 2014, which may have occurred due to unknown reasons in SG lambs. In Conclusion we can use TEC, PCV and TLC differentials (BASO, MONO, LYM and GRA) as indictor for growth rates in lambs, and utilize them in indirect selection for growth traits in Awassi lambs.

Table 1 : Pre and post weaning Lamb's growth traits (LS means ± S.E)

Traits		Growth Rate		Sex	
	Overall mean	FG	SG	Male	Female
BWT	4.21 ± 0.07	4.14 ± 0.09 a	4.21 ± 0.10 a	4.35 ± 0.08 a	4.00 ± 0.02 b
WWT	15.13 ± 1.48	19.50 ± 1.33 a	9.50 ± 0.42 b	14.55 ± 1.93 a	14.41 ± 3.49 a
DWG1	121 ± 16.52	171 ± 14.65 a	58 ± 4.81 b	113.33 ± 21.33 a	115.75 ± 27.63 a
FW	27.56 ± 3.21	37.17 ± 2.75 a	15.27 ± 0.91b	26.12±4.17a	26.31 ± 5.33 a
DWG2	126 ± 17.37	168 ± 14.64 a	58± 4.81 b	110 ± 22.50 a	113 ± 28.80 a

For each factor, means in the same row with different scripts differ significantly (P < 0.05).

Table 2 : Lamb's blood profiles according to Growth rate and sex groups (LS means ± S.E)

Traits	Overall mean	Growth Rate		Sex	
		FG	SG	Male	Female
TEC	10.15 ± 0.57	11.31 ± 0.62 ^{a}	8.42 ±0.69 ^{b}	10.30 ±0.74 ^{a}	9.42 ± 0.95 ^{a}
PCV	49.74 ± 1.24	52.49 ± 1.26 ^{a}	45.89 ±1.47 ^{b}	49.71 ± 1.57 ^{a}	48.69 ± 2.22 ^{a}
Hb / g	11.44 ± 0.64	11.58 ± 0.33 ^{a}	10.97 ± 1.47^a	11.75 ± 1.00 ^{a}	10.81 ± 0.45 ^{a}
MCH	14.71 ±2.37	13.09 ± 1.46 ^{a}	15.35 ± 5.25^a	16.74 ± 3.67 ^{a}	11.69 ± 0.89 ^{a}
MCHC	21.94 ± 0.42	22.17 ± 0.63 ^{a}	21.82 ± 0.54^a	21.69 ± 0.62 ^{a}	22.30 ± 0.43 ^{a}
TLC	3.92 ± 0.53	4.80 ± 0.63 ^{a}	2.60 ± 0.71 ^{a}	4.02 ±0. 74 ^{a}	3.38 ± 0.77 ^{a}
BASO	0.49 ± 0.18	0.84 ± 0.26 ^{a}	0.00 ±0.00 ^{b}	0.60 ± 0.27 ^{a}	0.15 ± 0.16 ^{a}
MONO	1.99 ± 0.28	2.55 ± 0.35 ^{a}	1.37 ± 0.31 ^{b}	1.77 ± 0.42 ^{a}	2.16 ± 0.24 ^{a}
LYM	86.51 ± 1.89	83.18 ± 2.40 ^{b}	91.16 ± 2.19^a	86.54 ± 2.85 ^{a}	87.70 ± 2.03 ^{a}
GRA	11.17 ± 1.75	14.29 ± 2.14 ^{a}	6.48 ± 2.12 ^{b}	11.57 ± 2.61 ^{a}	9.20 ± 1.98 ^{a}

Means in the same row with different superscripts differ significantly (P < 0.05).

Table 3 : Correlation coefficient between growth traits and blood profile.

	BWT	WWT	DWG1	FWT	DWG2
RBC	-0.201 N.S	0.55 *	0.56*	0.57 *	0.57 *
WBC	-0.247 N.S	0.35 N.S	0.36 N.S	036 N.S	0.36 N.S
PCV	-0.076 N.S	0.56 **	0.66 **	0.67 **	066 **
HB	0.176 N.S	0.13 N.S	0.12 N.S	0.13 N.S	0.13 N.S
MCV	0.200 N.S	030 N.S	0.30 N.S	0.29 N.S	0.30 N.S
HCH	044 N.S	0.006 N.S	-0.01 N.S	-0.009 N.S	-0.01 N.S
HCHC	-0.38 N.S	-0.05 N.S	-0.04 N.S	-0.038 N.S	-0.03 N.S
BASO	0.129 N.S	0.71 **	0.71 **	0.71 **	0.71 **
MONO	-0.21 N.S	0.69 *	0.710 **	0.705 **	0.71 **
LYM	0.19 N.S	-0.67 **	-0.67 N.S	-0.69 **	-0.69 **
GRA	0.16385 N.S	066**	0.68 **	067**	067 **

N.S: Non significant *: Significant ($P \leq 0.05$) **: Significant ($P<0.01$)

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