



Association of birth type with hematological parameters of Awassi Iraqi ewes

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Received: March 20, 2020	Abstract Reproductive traits can affect the hematological profile of ewes. Blood parameters changed in relation to the reproductive status of an animal. Therefore, this study aims to investigate the possibility of an association between the litter sizes with hematological parameters in Iraqi Awassi ewes. A total of 224 sexually mature ewes (non-pregnant, non-lactation) and healthy (124 ewes with single birth and 100 ewes with twin birth), aged between 2.5 to 5 years were included in this study. Blood samples were collected from the sheep. Samples were immediately transferred to the laboratory for a hematological examination. Results of the current study revealed some hematological changes between ewes according to litter size. The numbers of erythrocytes, Hb and PCV% were higher in Awassi ewes with twin birth ($8.106 \times 10^6/\mu\text{l}$), ($9.863 \pm 0.302 \mu\text{l}$) and (29.623 %) respectively than ewes with a single birth. According to the leukocyte constituents, the Awassi ewes with twin birth showed higher lymphocyte and lymphocyte % than ewes with a single birth. The highest and strongly positive correlation ($P < 0.01$) was recorded among litter size with RBC ($r=0.315$, $P=0.003$), PCV ($r=0.310$, $P=0.003$) and lymphocytes % ($r=0.366$, $P=0.002$). In conclusion, significant differences in hematological ($P < 0.01$) parameters were recorded between Awassi ewes according to the type of birth. A significant increase of RBC number, PCV and lymphocyte %, were determined in Awassi ewes with twin birth. Blood parameters can be used as good indicators of inference to a litter size of Awassi ewes.
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ارتباط نوع الولادة مع معايير الدم في النعاج العواسي العراقية

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المستخلص:

يمكن أن تؤثر الصفات التكاثرية على صورة الدم للنعاج. تتغير معايير الدم فيما يتعلق بالحالة التكاثرية للحيوان. لذلك ، تهدف هذه الدراسة إلى بحث إمكانية وجود ارتباط بين نوع الولادة مع معايير الدم في النعاج العواسي العراقية. تم تضمين مجموعه 224 من النعاج الناضجة جنسياً (غير حامل وغير مرضعة) وصحياً (124 نعجة ذات ولادة مفردة و 100 نعجة ذات ولادة توائم) ، تتراوح أعمارهم بين 2.5 إلى 5 سنوات. تم جمع عينات الدم من الأغنام. تم نقل العينات على الفور إلى المختبر لفحص صفات الدم. كشفت النتائج عن بعض التغيرات الدموية بين النعاج حسب نوع الولادة. كانت أعداد كريات الدم الحمراء ، تركيز الهيموغلوبين و نسبة مكداس الدم أعلى في النعاج العواسية ذات ولادة التوائم (8.106×10^6 / ميكرو لتر) ، ($0.302 \pm 9.863 \mu$) و (29.623%) على التوالي من النعاج ذات الولادة المفردة. وفقاً لمكونات الكريات البيض ، أظهرت النعاج العواسي ذات ولادة التوائم نسبة أعلى من الخلايا اللمفاوية ونسبة الخلايا اللمفاوية من النعاج ذات الولادة المفردة. تم تسجيل أعلى ارتباط موجب ($P < 0.01$) بين نوع الولادة مع كريات الدم الحمر ($r=0.315$ ، $P=0.003$) ، مكداس الدم ($r = 0.310$ ، $P = 0.003$) ، ونسبة الخلايا اللمفاوية ($r=0.366$ ، $P=0.002$). نستنتج مما تقدم ، تم تسجيل اختلافات معنوية في الدم بين النعاج العواسية حسب نوع الولادة. تم تحديد زيادة كبيرة في عدد كريات الدم الحمر ، مكداس الدم ونسبة الخلايا اللمفاوية في النعاج العواسي ذات ولادة التوائم. يمكن استخدام معايير الدم كمؤشرات جيدة للاستدلال إلى نوع الولادة للنعاج العواسية.

الكلمات المفتاحية: نوع الولادة ، معايير الدم ، الاغنام

Introduction.

The productivity of ewe has been measured by litter size that represents the greatest part of the income in sheep production (Ekiz *et al.*, 2005). Litter size is the most important component in terms of the economic trait of sheep production (Sodiq *et al.*, 2011). Reproductive traits could affect the hematological profile of Santa Inês and Morada Nova ewes (Bezerra *et al.*, 2017). Besides, hematological characteristics are important for knowing the health and reproductive traits of sheep and other animals (Owusu *et al.*, 2016), and are useful for assessing the physiological condition (Pieragostini *et al.*, 2010; Islam *et al.*, 2018). Health status and reproductive traits of an animal without hematological parameters could have low reliability and low accurate diagnosis (Al-Samarai & Al-Jbory, 2017). Assessment of various haematology parameters could be used to evaluate the general health status of production animals



(Jawasreh & Ismail, 2019). It is well recognized that hematological parameters in sheep and goats show several variations concerning breeding, age, sex, physiological status, and genotype of the animal (Oramari *et al.*, 2014; Arfuso *et al.*, 2016; Ahmed *et al.*, 2018). Few reports studied the association of reproductive traits with hematological parameters in sheep. Bezerra *et al.* (2017) studied the hematological analysis of Morada Nova and Santa Inês ewes in all reproductive stages. Owusu *et al.*, (2016) revealed a significant difference ($P < 0.05$) in some hematological values of lactating ewes and non-lactating ewes in the Djallonke sheep of Ghana. Based on the above consideration, no research yet on the association of the litter size with the hematological parameters have been reported in Awassi ewes. Thus, the current studies aimed to evaluate the association of litter size with hematological parameters in Awassi ewes.

Materials and Methods

Animals, blood sampling and analysis

This study was conducted according to regulations of the international recommendations for the care and use of animals under Al-Qasim Green University's approval (Agri, No. 015,3,12), at the College of Agriculture /Department of Animal Resources for the period from January 2019 to August 2019 on Awassi ewes. A total of 224 sexually mature (non-pregnant, non-lactation) and healthy ewes aged between 2.5 to 5 years were included in this study. Animals were collected randomly from two stations for raising sheep (Babylon and Karbala) including (124 ewes with single birth and 100 ewes with twin birth). They were fed *ad libitum* on seasonal grass, and freshwater, but concentrate food supple was about 2.5% of their live body weight daily, comprising a mixture of barely (59%), bran (40%), salt (1%) concentrates. Blood samples were collected from the sheep via puncturing of the external jugular vein by 18-gauge sterile disposable needle and blood taking using vacutainer tubes with EDTA. Samples were immediately transferred to the laboratory for a hematological examination. In the laboratory, haematology analyzer (vet.18, mythic company) was used to measure the hematological parameters. These parameters included erythrocyte constituents, total platelet count, and white blood cell constituents.

Statistical analyses

The Statistical Package (SPSS) software version 23.0 was used to analyze the significant effect of litter size on the various parameters studied with the general linear model.

$$Y_{ijkl} = \mu + L_i + P_j + A_k + e_{ijkl}$$

where Y_{ijkl} = phenotypic traits, μ = overall mean, L_i = fixed effect of i^{th} litter size (i = single, twin), P_j = fixed effect of j^{th} parity (j = 1, 2, 3, 4), A_k = fixed effect of k^{th} age group (2.5-3.5, >3.5-5), and e_{ijkl} = random error associated with Y_{ijkl} observation and assumed to be NID ($0, \sigma^2 e$). Means were compared using the Tukey-Kramer test with a significance level of ($P < 0.05$). Preliminary statistical analysis indicated the



effect of factor interaction, season and station did not have a significant effect on phenotypic traits, so they are not matched in the general linear model.

Results and Discussion.

Association analysis of litter size with haematology parameters of Awassi ewes

Association analysis of litter size refers to some hematological changes that occur in this study. Table 1 and 2 shows the least-square means of erythrocyte constituents and platelets as affected by litter size. The count of RBC, Hb, and PCV% were significantly higher ($P < 0.05$) in Awassi ewes with twin birth With mean values ($8.106 \times 10^6/\mu\text{l}$), (9.863 ± 0.302) and (29.623%) respectively than ewes with single birth, while there was no significant difference ($P > 0.05$) for other parameters. According to the leukocyte constituents, the Awassi ewes with twin birth showed higher lymphocyte and lymphocyte% than ewes with single birth, while no statistically significant difference was observed for the other leukocyte profile ($P > 0.05$) (Table 2).

Table 1. Least square Mean \pm SE of erythrocyte constituents and platelets for the litter size of Awassi ewes.

Indices		RBC ($\times 10^6/\mu\text{l}$)	Hb (g/dl)	PCV (%)	MCV (fl)	MCH (pg)	MCHC (g/dl)	PLT ($\times 10^3/\mu\text{l}$)
Litter size	Single	6.667 \pm 0.333 ^b	8.106 \pm 0.535 ^b	24.242 \pm 1.294 ^b	34.566 \pm 4.164 ^a	8.430 \pm 0.626 ^a	23.287 \pm 1.671 ^a	761.510 \pm 61.326 ^a
	Twin	8.106 \pm 0.345 ^a	9.863 \pm 0.302 ^a	29.623 \pm 1.251 ^a	35.426 \pm 4.299 ^a	8.220 \pm 0.298 ^a	22.443 \pm 1.795 ^a	630.300 \pm 36.934 ^a
P-value		0.005	0.050	0.006	0.632	0.797	0.699	0.115

RBC, red blood corpuscular; Hb, haemoglobin; PCV, packed cell volume; MCV, mean corpuscular volume; MCH, mean corpuscular haemoglobin; MCHC, mean corpuscular haemoglobin concentration; PLT, platelets. Different superscript in the same column indicates significant differences ($P < 0.05$).

Table 2. Least square Mean \pm SE of the constituents of white blood cell count for the litter size of Awassi ewes.

Indices		WBCs ($\times 10^3/\mu\text{l}$)	Lymphocytes ($\times 10^3/\mu\text{l}$)	Mono-cytes ($\times 10^3/\mu\text{l}$)	Granulo-cytes ($\times 10^3/\mu\text{l}$)	Lympho-cytes (%)	Mono-cytes (%)	Granulo-cytes (%)
Litter size	Single	8.714 \pm 1.362 ^a	4.877 \pm 0.610 ^a	0.604 \pm 0.032 ^a	3.858 \pm 0.115 ^a	60.243 \pm 5.994 ^b	12.912 \pm 0.602 ^a	32.885 \pm 1.278 ^a
	Twin	9.200 \pm 1.089 ^a	6.751 \pm 0.210 ^a	0.706 \pm 0.014 ^a	3.111 \pm 0.033 ^a	87.835 \pm 5.569 ^a	10.670 \pm 0.346 ^a	30.494 \pm 1.397 ^a
P-value		0.140	0.050	0.294	0.261	0.005	0.803	0.297

WBC, white blood cell; Different superscript in the same column indicate significant differences ($P < 0.05$).

The result of the current study refers to the presence of significant differences ($P < 0.05$) in hematological parameters between Awassi ewes according to the type of birth. Blood parameters are good indicators of return to reproductive activity (Bezerra *et al.*, 2017). Njidda *et al.*, (2014) and Owusu *et al.*, (2016) refers that the physiological condition of the sheep influenced blood parameters including RBC, WBC and lymphocyte counts and percentage of PCV and concentration of Hb. Bezerra *et al.*, (2017) demonstrated that the total red cells and lymphocyte count were influenced by the reproductive stages. This variation may be because of the requirement to a supply



of oxygen, which stimulates an adaptive response in which increasing haemoglobin concentrations and nutrients in reproductive stages (Gravena *et al.* 2010). The neutrophil/lymphocyte ratio also increases according to the reproductive stages and can be used to assess the stress and reproductive stages in animals (Yaqub *et al.*, 2013).

Correlation analysis of litter size with haematology parameters of Awassi ewes:

The correlation coefficient between litter size and phenotypic traits of the Awassi ewes are shown in Table 3. The highest and strongly positive correlation ($P < 0.01$) was recorded among litter size with RBC ($r=0.315$, $P=0.003$), PCV ($r=0.310$, $P=0.003$) and lymphocytes % ($r=0.366$, $P=0.002$).

Table 3. Correlation between litter size and haematology parameters in Awassi ewes

Variables	Litter size	
	r	*P-value
RBC ($\times 10^6/\mu\text{l}$)	0.315	0.003
Hb (g/dl)	0.106	0.180
PCV (%)	0.310	0.003
MCV (fl)	0.055	0.316
MCH (pg)	-0.030	0.398
MCHC (g/dl)	-0.045	0.349
PLT ($\times 10^3/\mu\text{l}$)	-0.181	0.058
WBCs ($\times 10^3/\mu\text{l}$)	-0.168	0.070
Lymphocytes ($\times 10^3/\mu\text{l}$)	-0.170	0.074
Monocytes ($\times 10^3/\mu\text{l}$)	-0.140	0.147
Granulocytes ($\times 10^3/\mu\text{l}$)	-0.150	0.131
Lymphocytes (%)	0.366	0.002
Monocytes (%)	-0.033	0.402
Granulocytes (%)	-0.139	0.149

* $P < 0.05$: Significant, $P > 0.05$: Not significant.

The result refers to the presence of positive and significant correlation ($P < 0.05$) among litter size with hematological parameters (Table 3). Blood sampling can indicate important information on physiological traits and play a vital role in the physiological status of an organism (Šoch *et al.*, 2011). This study consistent with the study of Saghi & Shahdadi, (2017) that reported the appositive correlation between litter size and phenotypic traits in Kordi sheep. Besides, significant positive correlations were determined between most of the hematological parameters in the blood of ewes with reproductive traits (Antunović *et al.*, 2017).



Significant differences in hematological parameters were recorded between Awassi ewes according to the type of birth. A significant increase of RBC number, PCV, lymphocyte, count and percentage, were determined in Awassi ewes with twin birth. Blood parameters can be used as good indicators of inference to a litter size of Awassi ewes.

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