Hematological Parameters of the ovine breed of Rembi in Tiaret, Algeria

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Abstract: *Hematological Parameters of the ovine breed of Rembi in Tiaret, Algeria.* The aim of this study was determine the influence of short and long days, age, sex, and phase of pregnancy status on hematological parameters in the ovin breed of the Rembi raised in Tiaret, Algeria. One hundred seventy two (172) cross-breed Rembi sheep (104 females and 68 males), from 2018 to 2019, aged between three months and four years old were used sheep were sampled in the short and long days. The age, sex, and phase of the pregnancy status were noted. Jugular blood samples were collected via vacutainer tubes with (EDTA) early in the morning and brought to the laboratory within two hours for analysis. In all samples, the number of white blood cells (WBC), red blood cell (RBC), packed cell volume (PCV), haemoglobin (Hb), mean cell volume (MCV), mean cell haemoglobin (MCH), mean cell hae-moglobin concentration(MCHC), Lymphocytes, Monocytes, and polynuclears were determined. In our study, the sex had a significant effect ($P < 0.05$) on monocytes with 1067.29 ±1223.33 for males and 422.08 ±272.78 for females but in the yearling male and female we haven't a significant effect, the phase of pregnancy had a significant effect ($P < 0.05$) on WBC, MCH, MCHC, Polynu-clears and Lymphocytes with 6738 ±1949.84(/ml), 14.71 ±4.13 pg, 37.39 ±9.99 g/dl, 1592.01 ±486.37/mm³ and 4702.76 ±1837.53/mm³ in the early pregnancy and 7046.36 ±3576.76/ml, 13.22 ±2.48 pg, 33.21 ±5.40 g/dl, 2282.05 ±1145.00 / / mm³ and 4057.34 ±3425.06/mm³ in the late preg-nancy respectively. The short and long days had a significant effect ($P < 0.05$) on RBC, Hb, PCV, plynucears and monocytes with 6.57 ±1.30 × × 10⁶/L, 9.17 ±1.06 g/dL, 25.87 ±5.16, 2799%, 92 ±1714.17/mm³, and 486.2 ±395.41/mm³ in the short days, and 7.18 ±1.85 × 10⁶/L, 9.75 ±1.31 g//dL, 28.57 ±6.96% 2343.27 ±1088.69/mm³, and 1662.07 ±1224.38/mm³, in the long days re-spectively. For the different stage of age between three months for 72 months we had a significant effect on RBC, Hb, MCV, MCH, polynuclears, lymphocytes and monocytes. this work showed that age, season, sex, phase of pregnancy affected significantly haematological parameters in cross bred Rembi sheep raised in western Algeria.

Key words: sheep, hematological, blood, sample, analysis

INTRODUCTION

In Algeria, sheep dominate and spread throughout the northern part of the coun-try, with a higher concentration in the steppe and semi-arid high cereal plains, it occupies an important place in the national economy (Bencharif 2011). The sheep's population is consisted of main dominant race (Ouled Djellal, Hamra, Rembi) and secondary breeds such as Berber, Barbarine, D'men and Sidahou. (Chellig 1992).

The sheep can be considered as living bank against various natural calamities such as crop failure, drought, and flood. The consumption of the meat of sheep is high, leading to an increase in its price due to rapid urbanization (Rekik 2018). Blood is an important index of physiological and pathological changes in an organism (Mitruka and Rawnshey 1977). The primary function of the blood is to transport oxygen from respiratory organs to body cells (Duke 1975), thereby maintaining homeostasis of the internal environment (Bentrick 1974). Currently, a lot of information on hematological characterizations of sheep in the word are available (Hernandez Trevino 2017).

Soch et al. (2011) determined that the sampling in blood is an important diagnosis tool, to help identifing the physiological responses of an animal; through the clinical analysis can be known about health, well being and nutritional status. The hematological parameters influence the productive and reproductive capability of animals (Abdelfattah 2013), while variation are associated with several internal and external factors including age, sex, breed, season, race and physiological status of animal (Oramari et al. 2014).

Ramirez et al. (1998) considers that the parameters of concentration of erythrocytes, packed cell volume and hemoglobin concentration are important criteria to calculate the absolute hematimetric indices or indexes Wintrobe, which are used for the morphological classification of anemia's and are of great importance in veterinary medicine. The intensity of the immune response is linked to productive parameters, such as the reproductive efficiency, the shearing of the sheep and the milk (Azab and Abdel-Makssoud 1999).

The present work aimed to determine the hematological parameters standards values in Rembi breed sheep raised in Tiaret a semi-arid region at the west of Algeria.

MATERIALS AND METHODS

For this study, 172 apparently healthy Rembi sheep (68 males and 104 females) were used between October 2018 and August 2019. Animals were aged between three months and four years. Animals were raised in different farms across the Tiaret region. The age, sex, and phase of the pregnancy status were noted.

Jugular blood samples were collected via vacutainer tubes with (EDTA) early in the morning and brought to the laboratory within two hours for analysis. In all samples, the number of white blood cells (WBC), red blood cell (RBC), packed cell volume (PCV), haemoglobin (Hb), mean cell volume (MCV), mean cell haemoglobin (MCH), mean cell haemoglobin concentration (MCHC), Lymphocytes, Monocytes, and polynuclears were determined.

RESULTS AND DISCUSSION

It was reported that hematological and biochemical parameters of animals may vary based on factors like breed, age, and sex (Njidda et al. 2013). The parameters values, recorded in our work, were similar to those reported by authors (Naseir and Harith, 2014, Hernandez-trevino and al. 2016).

In our study sex had a significant influence ($P < 0, 05$) on monocytes values (Table1). The mean value of the monocytes for males reported in our

study was 1067.29 ±1223.33/mm³, significantly higher ($P < 0.05$) than females with 422.08 ±272.78/mm³, the pregnancy stage had also a significant influence ($P < 0.05$) on the mean value of the monocyts while the WBC was significantly higher ($P < 0.05$) in late pregnancy with 7046.36 ±3576.76/mm³ than in early pregnancy with 6738.00 ±1949.84/ /mm³. For the MCH mean values were significantly higher ($P < 0.05$) in early pregnancy with 14.71 ±4.13 pg than in late pregnancy with 13.22±2.48 pg. The MCHC mean values were significantly higher ($P < 0.05$) in early pregnancy with 37.39 ±9.99g/dl than the late pregnancy with 33.21 ±5.40 g/dl. The polynuclears levels were significantly lower in early pregnancy with 1592.01 ±486.37/mm³ than in late pregnancy with 2282.05 ±1145.00/mm³. The lymphocyte mean value was significantly lower in early pregnancy with 4702.76 ±1837.53/ /mm³ than late pregnancy with 4057.34 ±3425.06/mm³.

The mean value of the monocytes for non-pregnant females were significantly lower ($P < 0, 05$) with 422.08 ±272.78/mm³ than the yearling females with 1628.80 ±954.61/mm³.

In our work, the highest value of RBC's count was 7.09 ±1.94 × 10⁶/L for yearling males and the lowest value for yearling females was 5.99 ±1.79 × × 10⁶/mm³. In addition, the lowest mean MCHC value was observed in yearling females with 37.55 ±12.16 g/dl against 40.13 ±13.28 g/dl in yearling males without significant difference ($p > 0.05$).

The highest polynuclears mean value was 2000.15 ±1127.02/mm³ in yearling females while the lowest value was recorded in yearling male with 1815.85 ±1023.36/mm³. The highest value of lymphocytes mean value was 8551.72 ±2047.59/mm³ in yearling females than the yearling males with 6480.78 ±1466.10/mm³. The WBC mean value was higher for non-pregnant females with 17,238.67 ±29871.78/mm³ than the females in post-partum with 7952.67 ±1907.81/mm³. The highest value of lymphocytes was reported for the non-pregnant females with 6748.67 ±1685.54/mm³ than the post-partum females with 4550.48 ±1005.62/mm³. The highest WBC's mean value was 17,238.67 ±29,871.78/mm³ in females, while the lowest value was recorded in males with 9726.84 ±3176.09/mm³.

WBC value was lower than those reported for Iraqi Awassi sheep with 9518.6 ±314/ml for males and 10,375 ±22/ml for females (Naseir and Harith 2014). The lowest platelets value was recorded in females with 423,733.33 ±108,746.4/ /ml than 389,789.47 ±170,628.85/ml for males which is similar to 312,200 ±16,600/ml reported for Iraqi Awassi sheep's males and 270,800 ±10,200/ml for females (Naseir and Harith, 2014).

In this study the day period had a significant influence ($P < 0.05$) on the measured parameters (Table2). The RBC, Hb, PCV and monocytes values were significantly ($P < 0.05$) higher in long day with 7.18 ±1.85 × 10⁶/L, 9.75 t ±1.31 g/dL, 28.57 ±6.96%, 1662.07 ±1224.38/ /mm³ than the short day with 6.57 ±1,30 × × 10⁶/L, 9.17 ±1.06 g/dL, 25.87 ±5.16%, 486,20 ±395.41/mm³ respectively. In contrast, the polynuclears mean value was significantly higher ($P < 0.05$) in the short day with 2799.92 ±1714.17/ml than the long day with 2343.27 ±1088.69/ml.

Table 1: Mean ±*SD* values of haematological parameters in sheep.

Statut	Nonpregnant (15)	Males (57)	Early Pregnancy (15)	Late Pregnancy (44)	Post-partum (15)	Yearling females (15)	Yearling males (11)	Total (172)
WBC (/ml)	17238.67 ±29871.78	9726.84 ±3176.09	6738.00 ±1949.84*	7046.36 ±3576.76	7952.67 ±1907.81	12180.67 ±2961.71	9733.64 ±1389.74	9495.29 ±9452.47
RBC (x106/L)	6.10 ±1.47	7.07 ±1.71	6.54 ±1.49	7.16 ±1.50	6.85 ±1.14	7.09 ±1.94	5.99 ±1.79	6.88 ±1.62
Hb (g/dL)	9.63 ±0.66	9.72 ±1.02	9.09 ±1.05	9.23 ±1.54	9.03 ±0.86	9.97 ±1.24	9.19 ±1.58	9.46 ±1.22
PCV (%)	24.31 ±5.14	27.70 ±6.28	25.63 ±5.81	28.32 ±6.13	27.24 ±5.09	28.62 ±7.83	24.57 ±6.89	27.22 ±6.26
MCV (fl)	40.27 ±2.12	39.47 ±2.07	39.40 ±1.12	39.84 ±4.03	39.87 ±2.00	40.60 ±1.76	41.45 ±2.77	39.89 ±2.70
MCH (pg)	16.79 ±4.54	14.64 ±4.29	14.71 ±4.13	13.22 ±2.48*	13.51 ±2.65	15.25 ±5.22	16.56 ±5.66	14.55 ±4.08
MCHC (g/dl)	41.40 ±9.56	36.95 ±9.57	37.39 ±9.99	33.21 ±5.40*	34.04 ±6.57	37.55 ±12.16	40.13 ±13.28	36.42 ±9.24
Platelettes (/ml)	423733.33 ±108746.41	389789.47 ±170628.85	283866.67 ±123441.06	338568.18 ±165269.53	412200.00 ±159553.04	358333.33 ±96502.90	317909.09 ±104986.15	365023.26 ±154001.52
Polynuclears (/mm³)	2570.00 ±1123.72	3183.13 ±1767.22	1592.01 ±486.37*	2282.05 ±1145.00	2824.16 ±839.79	2000.15 ±1127.02	1815.85 ±1023.36	2556.00 ±1428.59
Lymphocytes (/mm3)	6748.67 ±1685.54	5582.42 ±2690.59	4702.76 ±1837.53	4057.34 ±3425.06*	4550.48 ±1005.62	8551.72 ±2047.59	6480.78 ±1466.10	5493.80 ±2803.72
Monocytes (/mm3)	422.08 ±272.78*	1067.29 ±1223.33	443.23 ±597.62	1529.17 ±1243.12	644.75 ±498.91	1628.80 ±954.61	1437.00 ±695.68	1095.38 ±1092.90

In the present study the age had a significant influence ($p < 0.05$) on the measured parameters (Table 3). The RBC's and Hb mean value were significantly ($p < 0.05$) lower in sheep aged 5 months than the other ages with $5.71 \pm 1.63 \times 10^6$/L and 8.00 ± 1.57 g/dL respectively. However, the higher value for the Hb and RBC's mean values were recorded at the 10-month age respectively with $10.88 \pm 0.88 \times 10^6$/L and 9.04 ± 0.68 g/dL. The MCV and lymphocytes mean values were significantly ($P < 0.05$) lower in sheep aged 6 months with 36.50 ± 2.43 fl, 1654.18 ± 1777.08/ml than the other age categories. The polynuclears and monocytes mean values were significantly ($P < 0.05$) lower in sheep aged 20 months with 2007.09 ± 514.81/mm³, 524.25 ± 466.69/mm³.

In our study, the lower mean value of WBC was recorded in animals aged 12 months with $12,775.43 \pm 17,148.92$/ /mm³. Firas and Wathiq (2017) reported WBC value of 8300 ± 470 for animals aged less than 12 months. The Hb mean value was significantly ($P < 0.05$) higher for 10 month age with 10.88 ± 0.72 g/dL however, Firas and Wathiq (2017) reported the value of 8.24 ± 0.19 g/dL. For the animals between 1 and 2.5 months, Firas and Wathiq (2017) reported a value of Hb with 8.42 ± 0.16 g/dL which is higher than our results with 9.74 ± 0.57g/dL for the sheep aged 20 months.

Table 2: Mean $\pm SD$ values for haematological parameters a variation within days lightning duration.

Days Lightning duration	Short (86)	Long (86)	Total (172)
WBC (/ml)	9,458.26 ±13,069.35	9,532.33 ±2,989.76	9,495.29 ±9,452.47
RBC (×10⁶/L)	6.57 ±1.30	7.18 ±1.85*	6.88 ±1.62
Hb (g/dL)	9.17 ±1.06	9.75 ±1.31*	9.46 ±1.22
PCV (%)	25.87 ±5.16	28.57 ±6.96*	27.22 ±6.26
MCV (fl)	39.51 ±2.07	40.27 ±3.18	39.89 ±2.70
MCH (pg)	14.55 ±3.74	14.55 ±4.41	14.55 ±4.08
MCHC (g/dl)	36.73 ±8.32	36.11 ±10.12	36.42 ±9.24
Platelettes (/ml)	366,883.72 ±140,078.50	363,162.79 ±167,579.72	365,023.26 ±154,001.52
Polynuclears(/mm³)	2,799.92 ±1714.17*	2,343.27 ±1,088.69	2,556.00 ±1,428.59
Lymphocytes (/mm³)	5,457.79 ±2,101.26	5,527.29 ±3,339.65	5,493.80 ±2,803.72
Monocytes (/mm³)	486.20 ±395.41	1,662.07 ±1,224.38*	1,095.38 ±1,092.90

*Refers to a significant difference in the same line ($P < 0.05$)

Table 3: Mean± *SD* values for haematological parameters in sheep within age.

Age (Month)	N	WBC (/ml)	RBC (x106/L)	Hb (g/dL)	PCV (%)	MCV (fl)	MCH (pg)	MCHC (g/dl)	Platelettes (/ml)	Polynuclears (/mm3)	Lymphocytes (/mm3)	Monocytes (/mm3)
3	6	10,225.00 ±2,514.84	7.02 ±2.05	9.77 ±1.00	28.72 ±8.55	41.17 ±1.72	14.80 ±3.66	36.10 ±8.63	356,833.33 ±81,959.54	1,454.60 ±902.82	7679.13 ±1,894.70	1,091.27 ±590.25
4	16	12,000.00 ±2645.07	6.71 ±1.98	10.00 ±1.29	27.04 ±7.78	40.63 ±2.13	16.41 ±5.97	40.26 ±13.58	356,687.50 ±108,761.34	2,096.88 ±1,066.34	8,153.12 ±2,098.83	1,750.00 ±836.37
5	4	9,107.50 ±1,841.24	5.71 ±1.63*	8.00 ±1.57*	23.65 ±5.80	42.00 ±3.46	14.90 ±5.65	35.98 ±14.45	256,000.0 0±43,235.79	1,924.74 ±1,358.78	5,759.91 ±1,298.07	1,422.85 ±1,099.88
6	46	12,775.43 ±17148.92	6.36 ±1.62	9.52 ±0.88	25.34 ±5.99	40.15 ±1.89	16.08 ±4.84	39.81 ±10.67	412,456.52 ±137,730.45	2,984.00 ±1,725.28	6,859.42 ±1,946.45	619.37 ±580.42
10	6	6,913.33 ±2,286.20	9.04 ±0.68	10.88 ±0.72	32.98 ±3.42	36.50 ±2.43*	12.05 ±0.37*	33.22 ±2.91	401,833.33 ±269,186.49	2,518.18 ±1,829.19	1,654.18 ±1,777.08*	2,740.98 ±2,237.35
12	21	9,841.43 ±2,228.83	7.08 ±1.75	9.94 ±0.89	28.05 ±6.68	39.81 ±1.54	14.91 ±4.04	37.30 ±9.02	287,904.76 ±172,384.72	2,496.54 ±916.72	5,845.07 ±2,258.16	1,499.69 ±1,156.07
19	15	7,952.67 ±1,907.81	6.85 ±1.14	9.03 ±0.86	27.24 ±5.09	39.87 ±2.00	13.51 ±2.65	34.04 ±6.57	412,200.00 ±159,553.04	2,824.16 ±839.79	4,550.48 ±1,005.62	644.75 ±498.91
20	5	6,564.00 ±791.32	7.47 ±0.61	9.74 ±0.57	29.04 ±3.05	39.00 ±1.00	13.06 ±0.69	33.70 ±2.27	316,200.00 ±93,207.83	2,007.09 ±514.81*	4,023.66 ±980.78	524.25 ±466.69*
24	1	4,950.00	9.15	10.10	33.70	37.00	11.00	30.00	575,000.00	2,376.00	1,188.00	1,386.00
36	11	6,808.18 ±2,287.57	7.76 ±1.33	9.65 ±1.46	31.45 ±6.06	40.36 ±2.16	12.54 ±0.96	31.07 ±3.29	466,454.55 ±147,256.49	3,021.63 ±1,393.85	2,323.63 ±1,655.56	2,280.30 ±1,277.83
48	12	4,273.33 ±1,555.54	6.64 ±0.71	8.33 ±1.10	25.25 ±3.31	38.00 ±2.00	12.53 ±0.68	33.03 ±1.81	283,416.67 ±119,633.12	980.14 ±764.41	3,468.45 ±829.85	248.32 ±112.14
60	22	7,414.09 ±2,701.17	7.10 ±1.50	9.38 ±1.09	27.84 ±6.15	39.27 ±2.16	13.83 ±3.59	35.30 ±8.75	314,318.18 ±168,449.90	2,713.27 ±1,618.30	3,633.51 ±2582.91	1,252.90 ±1,243.71
72	7	8,750.00 ±6,327.60	6.30 ±2.05	8.20 ±2.28	25.83 ±7.22	42.86 ±8.23	13.51 ±1.99	31.70 ±1.77	385,142.86 ±8,1495.25	2,728.66 ±1524.36	7,122.78 ±5,629.33	361.54 ±152.85
Total	172	9,495.29 ±9,452.47	6.88 ±1.62	9.46 ±1.22	27.22 ±6.26	39.89 ±2.70	14.55 ±4.08	36.42 ±9.24	365,023.26 ±154,001.52	2,556.00 ±1,428.59	5,493.80 ±2,803.72	1,095.38 ±1,092.90

*Refers to a significant difference in the same line (*P* < 0.05)

CONCLUSION

This work showed that age, season, sex, and the stage of pregnancy affected significantly hematological parameters in cross bred Rembi of sheep raised in western Algeria and it must be taken in consideration when hematological analysis was done in order to investigate pathologies in sheep.

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Streszczenie: *Parametry hematologiczne owczej rasy Rembi w Tiaret, Algieria.* Celem badania było określenie wpływu długości dnia świetlnego, wieku, płci i fazy ciąży na parametry hematologiczne u owcy rasy Rembi hodowanej w Tiaret w Algierii. Dane pochodziły od 172 owiec Rembi (104 samice i 68 samców), w wieku od trzech miesięcy do czterech lat. Próbki krwi pobierano z żyły szyjnej za pomocą probówek próżniowych z (EDTA) wcześnie rano i dostarczano do analizy w ciągu dwóch godzin. We wszystkich próbkach oznaczano liczbę limfocytów (WBC), erytrocytów (RBC), hematokryt (PCV), hemoglobinę (Hb), średnią objętość erytrocytów (MCV), średnią zawartość hemoglobiny (MCH), średnie stężenie hemoglobiny komórkowej (MCHC), monocyty

i wielojądrzaste granulocyty. Płeć miała znaczący wpływ ($P < 0,05$) na liczbę monocytów (1067,29 ±1223,33 tryki i 422,08 ±272,78 maciorki) u starszych zwierząt, zaś u rocznych nie zaobserwowano różnic. Faza ciąży miała znaczący wpływ ($P < 0,05$) na WBC, MCH, MCHC, wielojądrowe i limfocyty (6738 ±1949, 84/ ml, 14,71 ±4,13 pg, 37, 39 ±9,99g/dl, 1592,01 ±486,37/mm³ i 4702,76 ±1837,53/mm³ we wczesnej ciąży i 7046,36 ±3576,76/ml, 13,22 ±2,48 pg, 33,21 ±5,40g/dl, 2282,05 ±1145,00/mm³ i 4057,34 ±3425,06/mm³ odpowiednio w póżnej ciąży). Krótkie i długie dni wpłynęły ($P < 0,05$) na RBC, Hb, PCV, plynuceary i monocyty (6,57 ±1,30 × 106/L, 9,17 ±1,06 g/dL, 25,87 ±5,16, 2799%, 92 ±17 144,17//mm3 i 486,2 ±395,41/mm³ w krótkich dniach oraz 7,18 ±1,85 × 106/l, 9,75 ±1,31 g/dL, odpowiednio 28,57 ± 6,96%, 2343,27 ±1088,69/mm³ i 1662,07 ±1224,38/mm³, odpowiednio w długie dni). W wieku od trazech do 72 miesięcy obserwowano znaczący wpływ na RBC, Hb, MCV, MCH, wielojądrowe, limfocyty i monocyty. Praca ta wykazała, że wiek, pora roku, płeć, faza ciąży miały znaczący wpływ na parametry hematologiczne owiec Rembi hodowanych w zachodniej Algierii

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