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Effect of season, gender and its interaction on leukocyte profile and platelets count of Kosali breed cattle

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Abstract
Above three year age of apparently healthy 150 Kosali cattle of either sex was randomly identified to assess the effect of season, gender and its interaction on various leukocyte parameters in Kosali breed of cattle from the plain region of Chhattisgarh. 5ml of blood samples were collected from jugular vein into collection tubes (1.8mg EDTA /ml of blood) during different seasons (rainy, winter and summer) of year. Each sample was maintained at 4 ˚C for analysis of leukocyte profiles. Leukocyte profiles such as total white blood cell (TWBC), differential leukocyte count and platelet count were estimated with automatic blood analyzer. Seasons significantly affected all the constituent of leukocytes viz lymphocytes, mococytes, neutrophills, basopholls, eosinophills and neutrophills / lymphocyte ratio except platelets in Kosali cattle. Similarly, gender also significantly influenced all the constituent of leukocyte profile like lymphocytes, monocytes, neutrophils and neutrophills / lymphocyte ratio. Interaction of sex and season did not differ significantly the lecukocyte profiles except neutrophills / lymphocyte ratio. It can be concluded that gender and season variables affected the differential leukocyte count in Kosali breed of cattle in Chhattisgarh.

Keywords: Kosali, Chhattisgarh, leukocyte profile, differential leukocyte count

Introduction
India has different genetic groups of cattle in which 41cattle are registered and are adopted for different agro-climatic region of the country. In Chhattisgarh, the maximum populations are living in the rural area and the livestock are reared as a part of mixed farming system. The state is very rich in livestock population as per the 19th livestock census and it is more than 1.5 crores (Anonymous 2014) [3]. The cattle population is 9.8 million and its contribution (65%) is the highest to livestock population. In Chhattisgarh the Kosali is the first registered breed of cattle. It is unique cattle, well adapted to the existing agroclimatic conditions of the region. They are resistant to many bacterial, viral and parasitic diseases and have good capacity of heat tolerance. They require less care, management and can thrive well under the poor feed stuffs available in the state. These cows are smaller in size with poor milk production around 1–3 litre of milk daily.

Hematological values of different animals and their importance is well documented and acknowledged by the different workers (Opara *et al.* 2006) [12]. As the Physiological equilibrium is maintained mainly by the blood in the body (Geneser, 1986). Haematological values indicate stress, welfare (Anderson *et al.*, 1999) [2] and also adaptability to adverse environmental conditions (Shil *et al.*, 2012) [17]. Generally, it helps to develop the baseline information which further helps to assess the physiological, nutritional and managemental status of the animals and also help to diagnose and asses the health condition (Radostits *et al.* 2006, Jezek *et al.* 2006, Mir *et al.* 2008) [14, 5, 9]. The baseline information requires the establishment of range of reference values of different species of the animals in different regions as well as under existing environmental or climatically conditions and the deviation from the normal reference values defined the pathological values and the pathological condition of animals (Radostits *et al.* 2006) [14]. The haematological parameters of cattle are influenced by many factors like breed, age, sex, season, health and nutritional status of the animal, physiological conditions like lactation and pregnancy (Sattar and Mirza, 2009) [16]. Such type of study has not been reported in Kosali breed of Chhattisgarh. Keeping the above facts the study was undertaken to generate the baseline data of leukocyte profile considering affect of gender and season in the plain area of Chhattisgarh.

Materials and Methods

In the present study, total of 150 Kosali cattles (from different plain regions of Chhattisgarh) of more than three year of age were selected. These animals were in open housing system and in normal nutritional condition at the time of sample collection. 5ml of blood samples were collected aseptically from jugular vein by using the ethyelenediamine tetra acid (EDTA) at a concentration of 1-2mg/ml of blood in collection tube. The samples were collected at morning between 7.00 and 9.00 AM during different seasons (rainy, winter and summer) of year. After collection the samples were transported to laboratory within one hour at 4 °C temperature for analysis of blood leukocyte profile. The leukocyte profiles such as total white blood cell (TWBC), Differential leukocyte count, Lymphocyte, Monocyte, Neutrophils, Basophills, Eosinophills and Neutrophil / Lymphocyte ratio and Platelate counts were estimated with automatic blood analyzer.

The data obtained in the study were analyzed statistically following two-way analysis of variance (ANOVA) and significance difference was determined by Tukey's post hoc test. Effect of season and sex were also analyzed following standard method as per Snedecor and Cochran, 1994 [18] and its interactions were also observed.

Result and Discussion

The effect of season, sex and its interaction on leukocyte profile has been presented in table 1.

Monocytes, Neutrophils and N/L ratio differed significantly (p<0.01) between male and female of Kosali cattle during rainy season, however, these values did not differ significantly during winter and summer season between two sexes. Monocyte was observed significantly (p<0.01) higher in female cattle, whereas neutrophils and N/L was observed significantly (p<0.01) higher in male cattle. Lymphocyte value differed significantly (p<0.01) between male and female of Kosali cattle during summer season, however, these values did not differ significantly during winter and rainy season between two sexes. Female cattle of Kosali showed significantly (p<0.01) higher lymphocytes than male. WBC, eosinophil, basophil and platelets did not differ significantly between female and male during all the three seasons. Sex affected significantly the leukocyte profile except platelets irrespective of season. Similarly seasons also affected all the parameters of differential leuckocyte counts in Kosali breed of cattle irrespective of sex, however its interaction effects were nonsignificant except for N/L ratio.

In the present study the mean TLC of apparently healthy adult Kosali cattle was in range of 7.5 -11.5 (x 10^3/mm^3) which was in accordance with the Hardhenu, sahiwal and hariana (Kumar *et al*., 2017). However the lower values of leukocytes were reported in Sahiwal (Arief *et al*. 2013) and Khillar cattle of Karnataka (Sripad *et al*., 2014) [19]. They are the body's defense system against infections. There is no significant difference was observed in lymphocyte counts and the range was 45-60% which was comparable to Hardhenu, sahiwal and Hariana cattle (Kumar *et al*., 2017). However the higher range of lymphocyte was reported in Sahiwal cattle (Arief *et al*. 2013) and Khillar cattle of Karnataka (Sripad *et al*., 2014) [19]. The significant difference was observed in the monocytes in rainy season and the range was 3-5 which was supported by the report in sahiwal cattle (Kumar *et al.,* 2017a) [8] and Hardhenu, sahiwal and Hariana cattle (Kumar *et al.,* 2017b) [7]. However the higher value was reported in sahiwal (Roy *et al.,* 2010) [15]. Neutrophils differed significantly (p<0.01) between male and female of Kosali cattle during rainy season, however, neutrophil did not differ significantly during winter and summer season between two sexes.

Table 1: Effect of season, gender and its interaction on haematological parameters (WBC etc.) on Kosali breed of cattle in Chhattisgarh

Particulars	Rainy Season		Sig.	Winter Season		Sig.	Summer Season		Sig.	P value due to overall effects		
	Female	Male		Female	Male		Female	Male		Gender	Season	GxS
TWBC (10^3/µl)	7.94 ±0.31	7.89 ±0.36	0.916	9.03 ±0.30	9.82 ±0.25	0.052	10.72 ±0.28	11.03 ±0.26	0.416	0.150	0.001**	0.368
LYMP (%)	50.01 ±0.54	48.85 ±0.37	0.086	59.59 ±0.43	59.56 ±0.51	0.966	49.48 ±0.57	47.23 ±0.24	0.001**	0.003**	0.001**	0.059
MONO (%)	4.42[a] ±0.17	3.54[b] ±0.17	0.001**	3.75 ±0.13	3.58 ±0.13	0.353	3.63 ±0.14	3.51 ±0.14	0.565	0.002**	0.021*	0.021
NEUT (%)	41.86[b] ±0.49	43.95[a] ±0.29	0.001**	33.19 ±0.45	32.95 ±0.44	0.709	44.21 ±0.35	47.35 ±0.29	0	0.001**	0.001**	0.001
EOSIN(%)	3.48 ±0.31	3.42 ±0.33	0.941	3.44 ±0.30	3.76 ±0.36	0.499	2.47 ±0.19	1.93 ±0.18	0.055	0.711	0.001**	0.341
BASO (%)	0.21 ±0.02	0.23 ±0.02	0.594	0.27 ±0.02	0.25 ±0.02	0.669	0.19± 0.01	0.20 ±0.02	0.708	0.795	0.033*	0.754
N/L	0.84[b] ±0.016	0.90[a] ±0.00	0.003**	0.55 ±0.01	0.55 ±0.01	0.816	0.89 ±0.02	1.00 ±0.00	0	0.001**	0.001**	0.001**
PLT (10^3/µl)	235.68 ±23.76	204.28 ±18.99	0.307	211.36 ±21.88	230.16 ±24.41	0.569	223.36 ±26.63	224.84 ±28.96	0.97	0.852	0.984	0.578

TWBC= Total White Blood Cell Count, Lymp.= Lymphocyte. Mono.= Moncytes, Neu.t=Neutrophils, Eosin.= Eosinophils, Baso.= Basophils, N/L= Neutophil : Lymphocyte Ratio, PLT= Platelet count

Note: Means [ab] having different superscript in a row differ significantly ** (P<0.01), * (P<0.05)

The neutrophils was observed significantly (p<0.01) higher in male cattle. In the present study range of neutrophil was 31-49 percentage which was in accordance with the report in Hardhenu, Sahiwal and Haeiana cattle (Kumar *et al*., 2017). However the lower range was reported in Khillar cattle in Karnataka (Sripad *et al*., 2014) [19]. Neutriphills make up roughly half of the white blood cell population. They are usually the first cells of the immune system to respond to invaders such as bacteria or viruses (Mayadas *et al*., 2014) [10]. Eosinophil, Basophil and Platelets did not differ significantly between female and male during all the three seasons. And the range was in normal range as reported in Sahiwal cattle (Parmar *et al.,* 2013) [13]. Eosinophills also play a role in fighting off bacteria. They are very important in responding to parasitic infections (such as worms) as well. They are perhaps best known for their role in triggering allergy symptoms

(Mcbrien *et al*., 2017) [11]. The N/L ratio differed significantly (p<0.01) between male and female of Kosali cattle during rainy season, however, these values did not differ significantly during winter and summer season between two sexes. N/L was observed significantly (p<0.01) higher in male cattle. The N/L ratio is an indicator of thermal stress in animals (Stranger *et al.,* 2005). The N/L ratio in the present study was at higher side which indicates the adaptation of Kosali cattle in the extreme hot climate of Chhattisgarh.

Conclusion

It was observed in the present study that the effect of rainy season on differential leuckocyte counts viz lymphocyte, monocytes, neutrophils was more than other two seasons in kosali cattle. Higher value of neutrophils and N/L ratio was also observed in male then females.

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