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Comparative Evaluation of Hematological Parameters in Hardhenu, Hariana and Sahiwal Cattle at Different Age Groups

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ABSTRACT

Study comprising seventy two cattle of three breeds/strain viz. Hardhenu crossbred strain, Hariana and Sahiwal breeds were carried out to evaluate the differences in hematological parameters. Each group consisted of 24 animals of different age groups i.e. 0-1 year, 1-2 year, 2-3 year and >3 year. The various hematological parameters i.e. hemoglobin (Hb), total leucocyte count (TLC), differential leucocyte count (DLC), packed cell volume (PCV), total erythrocyte count (TEC), mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC) and mean corpuscular volume (MCV) in all the three breeds/strain at different ages were studied. Significantly higher Hb % especially at the age of 2-3 year was observed in Sahiwal animals over other 2 breed groups. Well known feature of higher disease resistance of Hariana breed was supported by significantly higher TLC as compared to other two breeds. The age wise significant difference was observed for group 1-2 years and, >3 years while Hariana showing high count. The lymphocyte, monocyte, neutrophils, Hct, TEC, MCH and MCHC were comparable in all the three breeds/strain.

Keywords: Hemogram, Age, Hariana, Sahiwal, Hardhenu

Sahiwal cattle is one of the best milch breed oh India characterized by heat tolerance and lofty milk production (Muhuyi *et al.,* 1999). Hariana breed of cattle are dual pupose breed and is also used for road transport and sustained ploughing work. However, Hariana breed is getting besmirched genetically due to crossing with exotic germplasms (Mahima *et al*., 2013). Hardhenu, a new strain of crossbred cattle which contain 62.5% blood of Holstein Friesian and 37.5% of Sahiwal and Hariana breed. Hardhenu is characterized by its heat tolerance power, good milk yield, resistant to both internal and external parasites and high conception rate.

The complete blood count (CBC) is an important and powerful diagnostic tool as a module of a bare minimum database. It can be used to monitor response to therapy, to gage the severity of an infirmity or as a starting point for formulating a list of differential diagnosis. However, integration of the data is important for the highest diagnostic yield (Barger, 2003). Hemoglobin and packed cell volume were included in metabolic profile tests amongst other biochemical constituents by Payne *et al.* (1970). So, blood examination is performed to assess the general health of the animal (Gutienez *et al*., 1971; Jain *et al*., 1993; Peinado *et al*., 1999). Variations in hematological constituents may act as vital indicators of the physiological or pathological state of the animal (Geneser, 1986; Ahmed *et al*., 2003). As there is no data available on the hematological values of Hardhenu strain, the current study was planned to study these parameters and comparing them with those in Hariana and Sahiwal breed of cattle.

MATERIALS AND METHODS

The samples were collected from the animals reared at LUVAS Cattle Livestock Farm, located in Hisar district

of Haryana at an elevation of 215 meters above sea level, with, Longitude - 29.1492° N and latitude - 75.7217° E coordinates. Animals were randomly chosen from each strain/breed and were divided into four groups according to their age i.e. 0-1 year, 1-2 years, 2-3 years and above 3 years of age. About 5 ml whole blood was harvested from jugular veni puncture in commercial vacutainer with EDTA with ample precaution not to cause pain and/or distress to the animals under the guidelines laid down by the Institutional Animal Ethics Committee and prevailing local laws and regulations.

The samples were transported to laboratory within one hour at 4°C temperature to ensure zero signs of hemolysis. The collected blood samples were analyzed for hemoglobin (Hb), total leucocyte count (TLC), differential leucocyte count (DLC), packed cell volume (PCV), total erythrocyte count (TEC), mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC) and mean corpuscular volume (MCV) by Automatic analyzer [1]MS4 (Melet Schloesing Laboratories – 9 Chaussee Jules Cesar-Evalic 402-95520 OSNY, France).

Statistical analysis

One way analysis of variance (ANOVA) was used as statistical tool to determine the level of significant differences among three breeds at 0.05% level of significance.

RESULTS AND DISCUSSION

Hemoglobin

The hemoglobin concentration was significantly highest ($P<0.05$) for Sahiwal animals being 10.99 ± 0.25 and lowest for Hardhenu being 10.18 ± 0.22 gm% (Table 1). Roy *et al.* (2010) also reported 12.15 ± 0.17 gm% Hb level in Sahiwal cows. The concentrations did not differ significantly among the breed/strain in age group 0-1 year. Hemoglobin levels were comparable with the previous reports of Aarif *et al.* (2013) and Pampori (2015).

The result revealed that the hemoglobin levels were significantly higher in the group 1-2 year, 1-2 year and 0-1 year age group for Hardhenu, Sahiwal and Hariana cattle, respectively. Chandra *et al.* (2012) also reported significant age related difference in Hb levels. The findings of Sripad

Table 1: Hematological profile (Mean ± S.E.) of three breeds/strain for different age groups

		Hb (g/dl)	Hct (%)	TEC (x10^6/mm^3)	MCH (pg)	MCHC (g/dl)	MCV (fl)
Hardhenu	**0-1**	11.01± 0.33	29.75±2.90	8.67±0.49	13.27±0.38	38.45±3.36	46.88±1.26
	1-2	9.58±0.61	37.79±1.62	9.54±0.64	11.31±0.14	29.97±0.46	44.06±0.88
	2-3	10.48±0.40^b	29.49±1.89	8.14±0.31	13.92±0.33	37.17±2.66	49.94±0.73^{ab}
	>3	9.63±0.27	26.90±2.21	7.26±0.21	14.29±0.43	39.10±3.94	53.35±2.40
	Mean	10.18±0.22^b	30.98±1.22	8.40±0.25	13.20±0.24	36.17±1.51	48.56±0.87^{ab}
Sahiwal	**0-1**	11.66±0.46	27.74±4.05	8.76±0.79	15.37±1.16	35.92±2.54	46.47±0.48
	1-2	10.32±0.53	38.39±2.81	9.96±0.52	11.35±0.30	30.63±0.58	43.67±0.75
	2-3	11.83±0.43^a	28.67±2.41	8.69±0.29	14.66±0.60	38.40±3.60	48.56±0.75^b
	>3	10.16±0.43	27.22±1.97	7.20±0.30	15.08±0.35	34.84±2.47	52.86±1.13
	Mean	10.99±0.25^a	30.51±1.56	8.65±0.25	14.11±0.41	34.95±1.30	47.89±0.63^b
Hariana	**0-1**	10.55±0.36	25.71±2.75	8.27±0.41	14.05±0.75	32.05±1.27	48.20±0.46
	1-2	11.01±0.32	40.18±1.47	10.61±0.33	10.75±0.32	30.10±0.51	44.94±0.69
	2-3	10.68±0.47^{ab}	29.47±1.34	8.36±0.20	14.08±0.40	34.58±2.11	51.12±0.39^a
	>3	9.72±0.38	27.31±1.98	6.84±0.16	15.09±0.43	33.61±2.17	57.30±1.18
	Mean	10.49±0.20^{ab}	30.67±1.26	8.52±0.24	13.49±0.34	32.59±0.84	50.41±0.76^a

The value (Mean ± S.E.) with different superscript in each column differ significantly among same age group ($P< 0.05$).

Table 2: Hematological profile (Mean ± S.E.) of three breeds/strain for different age groups

		TLC (x10^3/mm^3)	Lymphocytes (%)	Monocytes (%)	Neutrophils (%)
Hardhenu	**0-1**	8.89±0.63b	64.50±3.11	3.25±0.35	32.25±3.27
	1-2	10.37±0.63	65.17±2.34	2.67±0.19	31.33±2.17
	2-3	8.79±0.48^{ab}	66.42±2.56	3.58±0.54	30.00±2.71
	>3	8.10±0.56^{ab}	61.75±3.18	4.83±0.53	33.42±3.41
	Mean	9.29±0.28^{b}	64.46±1.39	3.58±0.24	31.75±1.43
Sahiwal	**0-1**	9.93±0.92^{b}	62.08±3.28	3.83±0.46	34.08±3.50
	1-2	11.32±1.09	66.83±1.86	2.83±0.21	30.33±1.82
	2-3	9.22±0.55^{a}	66.25±3.42	3.58±0.36	30.17±3.50
	>3	7.58±0.45^{b}	61.33±2.86	5.00±0.49	33.67±3.19
	Mean	9.51±0.43b	64.12±1.43	3.81±0.22	32.06±1.52
Hariana	**0-1**	12.88±0.76^{a}	61.33±2.27	3.17±0.21	35.50±2.37
	1-2	12.49±0.89	65.17±2.63	2.42±0.23	32.42±2.44
	2-3	7.55±0.36b	64.67±1.23	3.00±0.25	31.33±1.52
	>3	10.27±0.91^{a}	60.08±2.54	4.33±0.57	35.58±2.71
	Mean	10.49±0.20ab	62.81±1.13	3.23±0.20	33.71±1.15

The value (Mean ± S.E.) with different superscript in each column differ significantly among same age group (P< 0.05).

et al. (2014) regarding mean Hb level in different age groups of Krishnavelly breed are comparable to present study findings for Hardhenu, Sahiwal and Hariana.

Total Leucocyte Count (TLC)

Hariana animals revealed significantly higher (P<0.05) TLC in comparison to Hardhenu and Sahiwal (Table 2). The reported higher disease resistance capability (Jaiswal, 1997) agree well with our results of robust count for the first line of defense i.e. neutrophils in this breed. The mean TLC observed in age group 0-1 year for Hardhenu, Sahiwal and Hariana did not differ significantly among the breed/ strain. However, Hardhenu cattle count was comparable to both of the other two groups.

The TLC level for Sahiwal breed in breed specific, age wise groups were significantly higher for 0-1 year age group as compared to >3 years age group. The TLC level for Hariana breed in breed specific, age wise groups was significantly higher for the group 0-1 year and 1-2 year age groups as compared to 2-3 year age group. The results were found in accordance to the findings of Roy *et al.* (2010). However, comparatively low values have been reported by Arif *et al.* (2013) in Sahiwal.

Lymphocyte

The lymphocyte profile did not differ significantly among the breed/strain. However, similar mean value for Sahiwal has also been advocated by Parmar *et al.* (2013) and Aarif *et al.* (2013) in Sahiwal cattle. The % of lymphocyte did not differ significantly among the breed/strain (Table 2). The study by Sripad *et al.* (2014) reveals higher lymphocyte % 68.60 ± 0.97 (0-3 year), 66.60 ± 1.05 (3-6 year) and 67.10 ± 1.93 in 6-9 year age groups which is comparable to our findings for age specific groups of Hardhenu, Sahiwal and Hariana cattle.The lymphocyte % for Hardhenu crossbred cattle, Sahiwal as well as Hariana cattle in breed specific, age wise groups did not differ significantly.

MONOCYTE

The monocytes levels did not differ significantly among breeds/strain as well as age groups (Table 1). Parmar *et al.* (2013) reported lower % of monocyte while Aarif *et al.* (2013) reported much higher % in Sahiwal cattle compared to our results (3.81 ± 0.22) for Sahiwal. Similarly Raghunandanan *et al.* (1977) reported lower mean % of monocyte but much higher % revealed by Muthukumar *et*

al. (2004) and Mahima *et al.* (2013) in Hariana cattle in comparison of our result for Hariana breed (3.23 ± 0.20). The findings by Sripad *et al.* (2014) for mean monocyte % is 1.00 ± 0.10 (0-3 year), 1.33 ± 0.21 (3-6 year) and 1.25 ± 0.10 (6-9 year) in different age groups which is much lower than our mean for age specific groups for Hardhenu, Sahiwal and Hariana whereas Shil *et al.* (2012) found much higher mean of monocytes in calves (9.26 ± 3.39) as well as in lactating cows (6.84 ± 2.37) when compared to age specific groups (Table 2).

Neutrophil

The neutrophils % differs non-significantly among breeds/strain as well as among different age groups. However the findings of Sahiwal in present study corroborated the findings of Aarif *et al.* (2013) in non pregnant Sahiwal.

Hematocrit (Hct)

Estimation of hematocrit is of utmost importance to monitor the hydration status of animals (Bukhari, 2002). The Hct % profile did not differ significantly among the breed/strain. The sustenance of Hct over the entire period of study in all the groups shows comparable heat tolerance and resilience of the sample population (Sreedhar *et al.,* 2013). The Hct % in all three breeds of cattle was significantly higher for 0-1 year age group as compared to rest of three age groups which were similar (Table 1). Results were found in agreement with the findings of Aarif *et al.* (2013) in different groups viz., pregnant dry cow, non pregnant lactating cow and non pregnant dry Sahiwal cattle. Findings corroborate with the observation of Sischo *et al.* (1997) who observed that Hct and Hb did not exhibit specific trend in the animals.

Total Erythrocyte Count (TEC)

The TEC (10^6/mm^3) number did not differ significantly among the breed/strain. Results have been supported by Chandra *et al.* (2012).

Mean Corpuscular Hemoglobin (MCH)

The MCH differ non significantly among breeds/strain as well as among different age groups. The mean values of MCH for Sahiwal and Hariana observed in present study (Table 1) has also been advocated by Roy *et al.* (2010) in non-pragnant Sahiwal and Mahima *et al.* (2013) in Hariana cattle, respectively. Reported values of MCH by Shil *et al.* (2012) in calves lactating cows are also in agreement to this study.

Mean Corpuscular Hemoglobin Concentration (MCHC)

The MCHC did not differ significantly among three breeds/strains as well as among age groups also. However, the mean values for Sahiwal in present study (Table 1) is in correspondence with Parmar *et al.* (2013) and Aarif *et al.* (2013) in pregnant dry Sahiwal cattle. Whereas the mean values of Hariana (Table 1) is in agreement with Muthukumar *et al.* (2004) who worked on estrus Hariana heifer. The findings regarding MCHC of Shil *et al.* (2012) in lactating cows, stamped the findings for 0-1 year age group for age specific study in Hardhenu crossbred, Sahiwal and Hariana cattle.

Mean Corpuscular Volume (MCV)

Value of MCV in Hardhenu was not statistically different from the value of MCV in other two breeds. Hariana animal revealed significantly higher ($P<0.05$) MCV in comparison to Hardhenu and Sahiwal (Table 1) which can also justified by findings of Muthukumar *et al.* (2004) in Hariana cattle. Higher value for RBC volume may provide better opportunity to carry heat from body towards the skin surface and to dissipate it off (Parmar *et al.,* 2013). Higher MCV which is an index of RBC volume has importance in interpretation of metabolic profile test in cattle as discussed by Jazbec *et al.* (1993). Pampori *et al.* (2015) has earlier debated on relation of MCV and PCV on the premise that probably indigenous cattle have larger erythrocyte volume with high corpuscular volume (Table 1). The result of this study corresponds with results of Mahima *et al.* (2013) reported for Hariana cattle. Shil *et al.* (2012) also found MCV in agreement to age specific study in case of calves (44.62 ± 3.71) and lactating cows (49.99 ± 5.16). This could be attributed to juvenile cellular exuberance as majority of the animals are from young stock (Shil *et al.,* 2012).

CONCLUSION

Sahiwal animals showed significantly higher Hb % over other 2 breed groups but there was hardly any influence of age up to two years. The Sahiwal of 2-3 years age group revealed significantly higher Hb concentration. In consonance with the known higher disease resistance of Hariana breed, the present study revealed significantly higher TLC. The age wise difference was significant for group 1-2 year, >3 year with Hariana showing high count, otherwise result were comparable. The lymphocyte, monocyte, neutrophils, Hct, TEC, MCH and MCHC were comparable in all the three breeds/strain. The MCV in Hariana was found to be significantly higher but age wise difference were not observed.

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