

EFFECT OF DIFFERENT HOUSING SYSTEMS ON HAEMATOLOGICAL PARAMETERS OF BUFFALOES

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ABSTRACT

An experiment was conducted to study the effect of two housing systems on haematological parameters in buffaloes. Twelve buffaloes were selected and randomly divided into two equal groups. The animals of Group A were housed in shade with net and the animals of Group B in shade without net. The experiment was conducted for a period of three months. Blood samples were aseptically collected fortnightly and were analysed for haematological studies. The mean values for haemoglobin, total erythrocyte count, total leucocyte count, packed cell volume, mean corpuscular haemoglobin concentration and neutrophil were 8.49 ± 0.52 g/dl, 5.54 ± 1.05 (10^6 /cmm), 27.45 ± 0.44 (%), 31.15 ± 0.66 (%) and 40.99 ± 1.34 (%), respectively, which was nonsignificantly higher than the values of 8.20 ± 0.80 g/dl, 5.22 ± 0.66 (10^6 /cmm), 27.00 ± 0.58 (%), 30.35 ± 0.32 (%) and 39.96 ± 0.66 (%), respectively. Whereas, the values of mean corpuscular haemoglobin, lymphocyte, eosinophil and monocyte were 15.26 ± 1.06 (μg), 55.33 ± 0.44 (%), 2.32 ± 0.45 (%), and 1.69 ± 0.69 (%); respectively, which were non significantly

lower than the values of 15.72 ± 0.85 (μg), 55.56 ± 0.61 (%), 3.19 ± 0.05 (%), and 2.03 ± 0.84 (%), respectively in Group A as compared to Group B. However, the white blood corpuscle count (13.75 ± 0.56 , 10^3 /cmm) was significantly ($P < 0.01$) higher than the value of 10.58 ± 0.42 (10^3 /cmm) and the mean corpuscular volume (49.45 ± 0.21 , μ^3) was significantly ($p < 0.05$) lower than the value of 51.85 ± 0.45 (μ^3) in Groups A and B, respectively.

Keywords: housing systems, haematological parameters, buffaloes

INTRODUCTION

The buffalo, a triple purpose animal, is used primarily for milk in sub-continent although it does contribute significantly to draft animal power and meat. Buffalo are predominantly dairy animals which are distributed in different regions of the country and are well adapted to the local agro-climatic conditions. Buffaloes have a poor thermoregulatory system and are very vulnerable to extreme climatic conditions particularly in the

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summer season. Buffaloes are more sensitive to direct solar radiation than cattle due to their black body colour, which is conducive to heat absorption. A relatively small number of sweat glands per unit area of skin and a thick epidermal layer of the skin are a limiting factor in heat loss by conduction and radiation. Heat stress results from the animals' inability to dissipate sufficient heat to maintain homeothermy (Gautam Kumar, 2012). To protect buffaloes from infestation of pests, a new housing system covered with net is emerging. A study of whether this system would have a physiological effect was undertaken and the results are reported. The study will be helpful in protecting animals from infection which is caused due to flies, mange, etc and keeping them healthy.

MATERIALS AND METHODS

The experiment was conducted for three months i.e from 1st January 2013 to 31st March 2013 which comes during the winter season i.e. 5th November. - 4th March , Anonymous (1998). Twelve adult she buffaloes maintained at the buffalo breeding Farm, College of Veterinary and Animal Sciences, Parbhani were selected and randomly divided into two groups viz. Group A and Group B. The buffaloes reared in net shade (a shade is totally covered with 40 mm mesh to protect animals from bites of flies and is provided with a hurricane type of ventilator) were designated as Group A and buffaloes reared in shade without net (a conventional shade not covered with net and not provided with a hurricane ventilator) were designated as Group B. All the buffaloes selected in this study were apparently healthy and free of any parasitic infestations and other disease conditions.

Meteorological observations

Dry and wet temperatures were recorded at 07.30 h and 02.30 h using wet and dry bulb thermometers, both in the shade with net and shade without net. The temperature humidity index was calculated by using the formula of McDowell (1972).

Temperature Humidity Index (THI) = $0.72 [\text{Dry Bulb Temperature (DBT)} + \text{Wet Bulb Temperature (WBT)}] + 40.6$

Haematological parameters

Blood samples were collected between 07.00 and 08.00 hours at fortnightly intervals in both the groups by passing 18 gauge hypodermic needle into the jugular vein, 3 to 4 ml of blood was collected in a vial containing EDTA for haematological parameters such as haemoglobin (Hb), total erythrocyte count (TEC), total leucocyte count (TLC), packed cell volume (PCV), mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH), mean corpuscular haemoglobin concentration (MCHC) and differential leucocyte count (DLC) by using a haematology analyzer.

Analysis of data was carried out by using standard statistical procedures and interpretations by applying the student "t" test (Snedecor and Cochran, 1967).

Management and feeding of animals

The animals of both the groups were let loose for grazing between 8 a.m. and 4 p.m. and then they were stall-fed as per the schedule for the rest of the period of a day (24 h). The feed was composed of concentrate mixture, green and Jowar, kadbi as per their maintenance and production requirement. The animals of both the groups had free access to drinking water. They were

vaccinated against hemorrhagic septicemia, black quarter and rinderpest and were also dewormed regularly. Animals of both the groups were treated with the same feed, water and other managerial practices except the difference in the shade used for their maintenance.

RESULTS AND DISCUSSION

Haematological parameters

It is observed from Table 1, the mean value of haemoglobin was non significantly lower in Group B than the values of Group A. The low level of haemoglobin in both the groups of the present study might be due to haemodilution and a low level of nutrition due to depression of food intake with a rise in ambient temperature (Abdelatif *et al.*, 2009), who further stated that it might be due to depression of thyroid secretion which is associated with decreased erythropoiesis. The mean values of total erythrocyte count were higher in Group A (5.54 ± 1.05) as compared to Group B (5.22 ± 0.66). This is comparable to the finding reported by Marai and Haebe (2010). They reported that the red blood cell count was found to decrease significantly by 12 to 20 % in cattle under stress conditions due to destruction of erythrocytes and the haemodilution effect. Muna *et al.* (2009) stated that the release of erythrocytes from the spleen or the increase in oxygen consumption due to tissue demand causing erythrocyte stimulating factor release because the relationship between oxygen demand of tissue and amount of oxygen carried by blood some findings for cows and buffaloes. This releases the animal of greater internal heat load under climatic stress. The total leucocyte count were significantly ($p < 0.01$) lower in Group B (10.58 ± 0.42) than the count in Group A (13.75 ± 0.56). THI was also highest (Table

2) in Group A, which supports the investigation reported by Muna *et al.* (2009) and Jabbar *et al.* (2012). They further stated that the season revealed the significant differences in the values of leucocyte. The WBC count was significantly lower during the winter season and higher in the summer season, which supports the findings recorded in the present study on the 75th day which might be due to high THI and the beginning of the summer season. The mean values of packed cell volume were non significantly lower in Group B (27.00 ± 0.58) and higher in Group A (27.45 ± 0.44). Jabbar *et al.* (2012) state that seasonal changes also affect the PCV values and an increasing trend in PCV was seen during the winter. These findings are agreement with the present study of PCV, which shows an increasing trend in both the groups. Whereas, Abdelatif *et al.* (2009) reported the low values of PCV may be due to haemodilution. They further stated that vasodilation which occurs when animals are exposed to heat causes a decline in the hydrostatic blood pressure below blood colloidal pressure so that more interstitial fluid passes into the intravascular compartment. The mean corpuscular volume were significantly ($p < 0.05$) lower in Group A (49.45 ± 0.21) than the values of Group B (51.85 ± 0.45). The mean value of MCV is comparable to those mentioned by Muna *et al.* (2009) in the winter season.

Mean corpuscular haemoglobin values were higher in Group B than the values in Group A. All the average mean values of both the groups in the present study are comparable to the values reported by Verma *et al.* (2008) in the winter season. They studied on Murrah buffalo calves kept under two different housing system i.e. open site covered from wall to roof was closed, using gunny bag to prevent free flow of hot and cold wind. They further reported higher MCH values in the control

group and lower in the experimental group, which supports the finding of the present investigation.

The mean corpuscular haemoglobin concentration values in Group B were lower than the values of Group A. The average mean values in the present study were lower than the values reported by Verma *et al.* (2008) and higher than those reported by Muna *et al.* (2009). The relative consistency of MCHC in the present study may be attributed to concomitant increase or decrease in Hb concentration or PCV levels. Neutrophil showed non significantly higher values in Group A) and lower values in Group B. All the average mean values of neutrophil count were higher than the values reported by Serdaru *et al.* (2011) It is noticed that the neutrophil count was not affected by temperature throughout the study in either of the groups. Lymphocyte counts in Group B (55.56 ± 0.61) were non significantly lower than Group A (55.33 ± 0.44). The average mean values of the present study were in agreement with Serdaru *et al.* (2011). They studied on seasonal variation of some haematological parameters of the buffaloes during the winter period, which support the finding of the present work as conducted in the winter season. The mean values of eosinophil were higher in Group B (3.19 ± 0.05) and lower in Group A (2.32 ± 0.45). which is comparable to the findings reported by Muna *et al.* (2009). The increasing trend of temperature does not affect the eosinophil count in the present study. Increased eosinophil count may suggest the increased infestation and biting of pests in these animals.

Monocytes were also non significantly lower in Group A (1.69 ± 0.69) than the values of Group B (2.03 ± 0.84). The higher values in Group-B might be due to cortisol secretion (Abdelatif *et al.*, 2009). They further stated that monocytes respond to elevation in blood corticosteroid concentration,

but species differences are seen with the type of response and the mechanism of monocytosis which occurs in some species is not known. No basophil was observed in present study. However, all the average mean values were within normal physiological limits (Schalm's *et al.*, 2000).

Meteorological data

Meteorological variables are presented in Table 2. Temperature humidity index (THI) has been widely used as a heat stress index in buffaloes with values below 72 considered to be comfortable; 72-78 as mild; 78-88 as moderate and above 88 as extremely stressful (Bouraoui *et al.*, 2002). It is observed that THI of Groups A and B were 80.44 ± 0.56 and 78.71 ± 0.26 , respectively considered as moderately stressful to buffaloes. THI of 66.63 ± 0.45 at morning of Group A indicated that shade with net house though showing higher THI was in normal physiological range in which animals do not exhibit any discomfort.

CONCLUSION

The estimation of haematological parameters and THI in two shades (A and B) showed marginal variation, either lower or higher with non significant differences, indicating that netting of the shade does not adversely affect on these parameters during the winter season. Further THI estimated in net shade though higher than control shade was very much in the normal comfortable zone i.e. below 68, which indicated the comfort to the animals in both the shades throughout the experimental period. Further study is required to determine the effect of seasonal variations and different housing systems on haematological parameters.

Table 1. Effect of two housing systems on haematological parameters in buffaloes.

Parameter	Group A	Group B	Calculated t statistic	t value 05%	t value 01%	df
Haemoglobin (g/dl)	08.49±0.52	08.20±0.80 ^{NS}				
RBC (10 ⁶ /cmm)	05.54±1.05	05.22±0.66 ^{NS}				
WBC (10 ³ /cmm)	13.75**±0.56	10.58±0.42	3.15341	1.812461	2.228139	10
PCV (%)	27.45±0.44	27.00±0.58 ^{NS}				
MCV (μ ³)	49.45±0.21	51.85*±0.45	2.05762	1.812461	2.228139	10
MCH (μμg)	15.26±1.06	15.72±0.85 ^{NS}				
MCHC (%)	31.15±0.66	30.35±0.32 ^{NS}				
Neutrophil (%)	40.99±1.34	39.96±0.66 ^{NS}				
Lymphocyte (%)	55.33±0.44	55.56±0.61 ^{NS}				
Eosinophil (%)	02.32±0.45	03.19±0.05 ^{NS}				
Monocyte (%)	01.69±0.69	02.03±.84 ^{NS}				

*P<0.05, **P<0.01, NS-Non significant

Table 2. Meteorological observations of the two housing systems.

Meteorological	Group A	Group B	Calculated t statistic	t value 05%	t value 01%	Df
THI morning	66.63±0.45**	59.08±0.05	5.685537	1.710882	2.06389	24
THI afternoon	80.44±0.56 ^{NS}	78.71±0.26	1.566406	1.710882	2.06389	24

*P<0.05, ** P<0.01, NS-Non significant



Figure 1. Side view of net shade with ventilator.



Figure 2. Front view of net shade.

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