

EFFECT OF PLOUGHING WORK ON HEMATOLOGICAL PARAMETERS IN HALLIKAR BULLOCKS

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Abstract: The hematological parameters such as total erythrocyte count, total leukocyte count, hemoglobin content and packed cell volume were evaluated before and after ploughing work in Hallikar bullocks. Eight healthy bullocks which were yoked in pairs, aged between three to five years, used for ploughing work by the farmers for their routine agricultural work were selected for the present study. The ploughing work was carried out for a period of four hours during morning hours on each day of observation in the fields of ragi cultivation using simple country made wooden plough with an iron blade attached. The blood samples were collected in to the EDTA vials from each bullock aseptically by jugular venipuncture just before ploughing work at the cattle shed and after ploughing work in the field within ten minutes of completion of work. All the hematological parameters were determined with the help of hematology autoanalyzer. There was significant increase ($P < 0.05$) in the level of all the parameters in the individual bullocks at post work compared to pre work which could be due to hemoconcentration because of vapourization of body fluids during work. It was concluded that the determination of hematological parameters could be useful to take up certain animal welfare measures such as the duration of work period, providing sufficient drinking water and shelter after subjecting the bullocks for ploughing work.

Keywords: Hallikar bullocks, ploughing work, hematological parameters.

INTRODUCTION

Hallikar cattle are the pride breed of Karnataka which are known for their strong, quick, steady and endurance draught characters and they are distributed in southern districts of Karnataka such as Tumkur, Mandya, Mysore, Chamarajanagar, Hassan, Chitradurga and Kolar (Narayana Swamy, 2008; Singh *et al.*, 2008). The variations in hematological parameters are due to many complicated interdependent physiological responses. The studies on changes of hematological parameters in different breeds of working cattle such as Haryana

cattle (Upadhyay and Madan, 1988; Yadav *et al.*, 2001), Malvi bullocks (Singh *et al.*, 2013) and in other animals such as yak (Kataktaaware *et al.*, 2008) are available. But, there is paucity of information on the hematological changes in Hallikar bullocks when subjected to ploughing work under rural managemental practices. Therefore, the present study was planned to determine the effect of ploughing work on different hematological parameters when the animals were subjected to ploughing work for four hours duration by the farmers.

MATERIALS AND METHODS

Eight Hallikar bullocks aged three to five years yoked in pairs for ploughing work belonging to farmers of Manikikere Hosahalli, Tiptur Taluk, Tumkur District, Karnataka were selected for the study. The bullocks were housed in the cattle sheds that are properly ventilated with good visible light. The cattle sheds are normally the part of the living houses of the farmers having floor of stone slabs and tiled roof. Animals were fed with ration consisting of concentrates like groundnut cake with wheat bran and *ad libitum* ragi straw, routinely during the season of agricultural operation of ploughing work. The farmers were advised to maintain the bullocks under identical managemental conditions which were also supervised for uniformity during entire period of study.

Three trials of ploughing work were conducted on three different working days with an interval of ten days between each trial. The animals were used for ploughing work with a simple country made wooden plough with an iron blade attached, which is sufficient for the cultivation of ragi crop, a small millet.

From each bullock five ml of blood was collected from jugular venipuncture in to EDTA vials. Blood samples were collected twice from each animal in a trial, once before start of the work at the cattle shed where the animals were housed and once after work at the ploughing field. The hematological parameters such as total erythrocyte count (TEC), total leukocyte count (TLC), hemoglobin (Hb) content and packed cell volume (PCV) were determined with the help of automatic hematology analyzer (Schalm *et al.*, 2008) on the same day of collection within six hours.

The hematological values of three repetitive samples from each animal at pre work and post work were subjected separately to statistical analysis to obtain mean and standard error values. The mean and SE values were further analyzed with the aid of computerized statistical software, GraphPad Prism version 5.01 (2007) by application of paired t- test. Significance or non-significance of differences between the mean values at pre work and post work were determined at P value of 0.05.

RESULTS AND DISCUSSION

The mean values of various hematological parameters are presented in Table 1 and per cent changes in the parameters are presented in Table 2. All the parameters varied significantly ($P < 0.05$) with an increase at post-work compared to pre work. The changes in the hematological parameters could reflect the physiological or patho-physiological response of the body to the stress of ploughing work.

In the present study, there was significant ($P < 0.05$) increase in total erythrocyte count at post-work and the per cent increase was 1.45 compared to pre work condition. The significant ($P < 0.05$) increase in TEC values at post-work was in accordance with observations of Yadav *et al.* (2001) in bullocks that could indicate hemoconcentration after work. Shivaprakash (1993) in thorough bred horses and Piccione *et al.* (2007) in jumper horses also reported that at post-exercise there was significant increase in the values of TEC. Increase in TEC level after work could be due to contractions of the spleen and mobilization of erythrocytes from splenic reservoir into general circulation, *i.e.*, auto-transfusion of RBCs as a result of greater demand for oxygen and nutrients. Further, the conditions like asphyxia, blood loss, excitement and exercise will increase sympathetic activity and causes splenic contractions to result in the increase of number of circulating erythrocytes (Erickson and Poole, 2005).

Similarly, the increase in total leukocyte count was significant ($P < 0.05$) and it was by 9.15 per cent at post work. Such increased values of TLC after work in animals were reported by Yadav *et al.* (2001) in Haryana bullocks and Kataktalware *et al.* (2008) in Yak. Increased TLC level in post-work could be due to increased adrenocortical activity (Dunn, 1989) and or due to loss of water through evaporation, defecation and urination during work (Yadav *et al.*, 2001).

The packed cell volume was increased by 2.83 per cent at post work compared to pre work situation and the same was significant ($P < 0.05$). This finding was in accordance with the report of Yadav *et al.* (2001) in bullocks. Further, Shivaprakash (1993) in thoroughbred horses and Kataktalware *et al.* (2008) in yak also observed increase in PCV due to exercise or physical work. The increase in PCV could be due to increased total erythrocytes caused by decreased plasma volume. Increase in PCV after work in the current study, could be directly linked to increase in erythrocyte volume due to auto-transfusion of erythrocytes from splenic reserve into circulation. The increased RBCs in the circulation might cause decrease in cell: plasma ratio of blood resulting in increased PCV (Erickson and Poole, 2005). However, these

observations were not in conformity with the reports of Singh *et al.* (2013) who reported non significant variation of PCV in Malvi bullocks.

The changes in the values of hemoglobin in the present study were to the extent of 4.10 per cent increase at post work compared to pre-work of ploughing and it was significant ($P < 0.05$). The observed increase in hemoglobin per cent due to work was in agreement with the findings of Yadav *et al.* (2001) in bullocks. Further, Snow *et al.* (1988) in racing camels, Piccione *et al.* (2007) in jumper horses and Kataktalware *et al.* (2008) in yak reported the increase in hemoglobin values due to physical exercise or work.

However, few workers noticed the decline in hemoglobin content when the animals were subjected to working conditions and related the same to destruction of red blood cells during work, such as Upadhyay and Madan (1988) in Haryana bullocks, Shivaprakash (1993) in thoroughbred horses and Singh *et al.* (2013) in Malvi bullocks.

In the present study, the significant ($P < 0.05$) increase in hemoglobin content observed might be due to autotransfusion of RBCs into general circulation and also could be due to decreased plasma volume due to evaporative loss of body water through sensible and insensible heat loss, produced during work. The increase in hemoglobin content could be attributed to increase in TEC after work (Erickson and Poole, 2005).

It was concluded that the significantly increased changes of certain hematological parameters in the present study after four hours of ploughing in Hallikar cattle did not affect the comfort of the animals since the changes in the values were within the physiological ranges reported for cattle. The higher values of TEC, TLC, PCV and hemoglobin content suggested that it could be due to one or more reasons such as hemoconcentration due to dehydration, splenic contraction that adds blood cells to the circulation and increased adrenocortical activity due to work. Further, it was inferred that sufficient drinking water must be provided to the working animals after subjecting to the work to restore the hematological variations.

Table 1: Mean \pm SE values of hematological parameters at pre-work and post work in Hallikar bullocks (n=8)

Sl. No.	Parameters	Pre work	Post work
1	Total erythrocyte count ($10^6/\mu\text{l}$)	6.21 ± 0.15^a	6.30 ± 0.15^b
2	Total leukocyte count ($10^3/\mu\text{l}$)	9.18 ± 0.25^a	10.02 ± 0.30^b
3	Packed cell volume (%)	33.58 ± 0.75^a	34.53 ± 0.83^b
4	Hemoglobin (g %)	11.21 ± 0.24^a	11.68 ± 0.24^b

Mean \pm SE values with different superscripts in a row differ significantly ($P < 0.05$)

Table 2: Hematological parameters (Mean of differences between pre-work and post-work) and per cent increase or decrease in Hallikar bullocks

Sl. No.	Parameters	Mean of differences	Per cent increase
1	Total erythrocyte count ($10^6/\mu\text{l}$)	0.09	1.45
2	Total leukocyte count ($10^3/\mu\text{l}$)	0.84	9.15
3	Packed cell volume (%)	0.95	2.83
4	Hemoglobin (g %)	0.46	4.10

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