Indian J. Anim. Prod. Mgmt. Vol. 30(1-2) 99-104 (2014)

PHYSIOLOGICAL AND CERTAIN BIOCHEMICAL RESPONSES OF RED KANDHARI BULLOCK WITH DIFFERENT BULLOCK CARTS

V. S. INGLE*, M. F. SIDDIQUI, G. R. CHANNA AND GAUTAM KUMAR
Department of Livestock Production and Management,
College of Veterinary and Animal Sciences,
Parbhani, Maharashtra -431402, India
E-mail: drvinay22@ gmail.com

Received : 16.05.2014 ***Accepted : 29.06.2014***

ABSTRACT

Present study evaluated the physiological and biochemical responses of Red Kandhari bullock using three different kinds of bullock cart namely pneumatic, iron and wooden. Carting trials were carried out on three different road (Field road, Kaccha road, Tar road) using varying load (500, 750, 1000 kg). The physiological responses (respiration rate, heart rate and rectal temperature) were increased after carting depending upon load and road variables. However, blood glucose level was significantly depressed in iron and wooden bullock carts after carting when compared with the pre-carting values. These findings indicated that physiological response and blood glucose level varies according to the work load, road and carting conditions in Red Kandhari bullocks.

Key words : Bullock cart, Draft, Physiological response, Glucose

Draught animals play an important role in Indian agriculture and rural transport. They will continue to do so for several decades to come even with the present mechanization in agriculture. In India, draught bullocks are evolved and adapted to work under stressful hot- humid conditions[1]. According to recent estimates, India's petroleum and natural gas resources may last for 25-30 years and coal for 130-140 years[2]. As these perishable resources need to be used judiciously, the current draught animal efficiency has to be studied[3]. Red Kandhari bullock is a draught breed native to Maharashtra. Its draught adaptability and physiological capacity is not fully explored. So, these variables were determined in the present study.

MATERIALS AND METHODS

Two healthy pairs of Red Kandhari bullocks of almost same age (H"5 years), body weight and body measurement were selected from Red Kandhari Research and Instructional Farm, College of Veterinary and Animal Sciences, Parbhani, India. Carting trials were carried out with iron bullock cart with pneumatic wheel (C1) iron cart (C2) and wooden cart (C3) at various road conditions i.e. Field road (R_1), Kaccha road (R_2) and Tar road (R_3). The gunny bags filled with sand were utilized for maintaining different payloads, i.e. 1000 kg (L_1), 750 kg (L_2), 500 kg (L_3). Each trial was conducted for 3 consecutive days for each pair and each load on three road conditions during the months of March to May 2011. The bullocks were used for research work from 08.00 am until the fatigue level of animal is reached. The mean ambient temperature varied from 24.9°C to 40.9°C and mean minimum and maximum relative humidity varies between 25 to 63 percent respectively. The soil in the experimental field was medium to deep black cotton and well drained. The weight of pneumatic and iron bullock cart was 315 kg and 250 kg, respectively whereas the weight of the cart man was taken as 50 kg.

Physiological observations

The respiration rate (breath/minute) was noted before and after each trial, and was followed for three consecutive days for each carting trial of the experiment. The heart rate (beats/min) was recorded before and after completion of carting for each road and each load condition of operation each day for consecutively 3 days.

The rectal temperature (°C) was recorded before and after completion of carting for that road and load condition of operation of each day for consecutively 3 day. Blood sample from each animal was obtained 10 to 15 minutes prior to the carting and immediately after the work of carting operation on each road and load condition was completed. Serum was separated by centrifugation and glucose level was estimated using standard clinical procedures.

Statistical analysis : The data obtained were subjected to complete randomized design[4].

RESULTS AND DISCUSSION

Physiological Responses

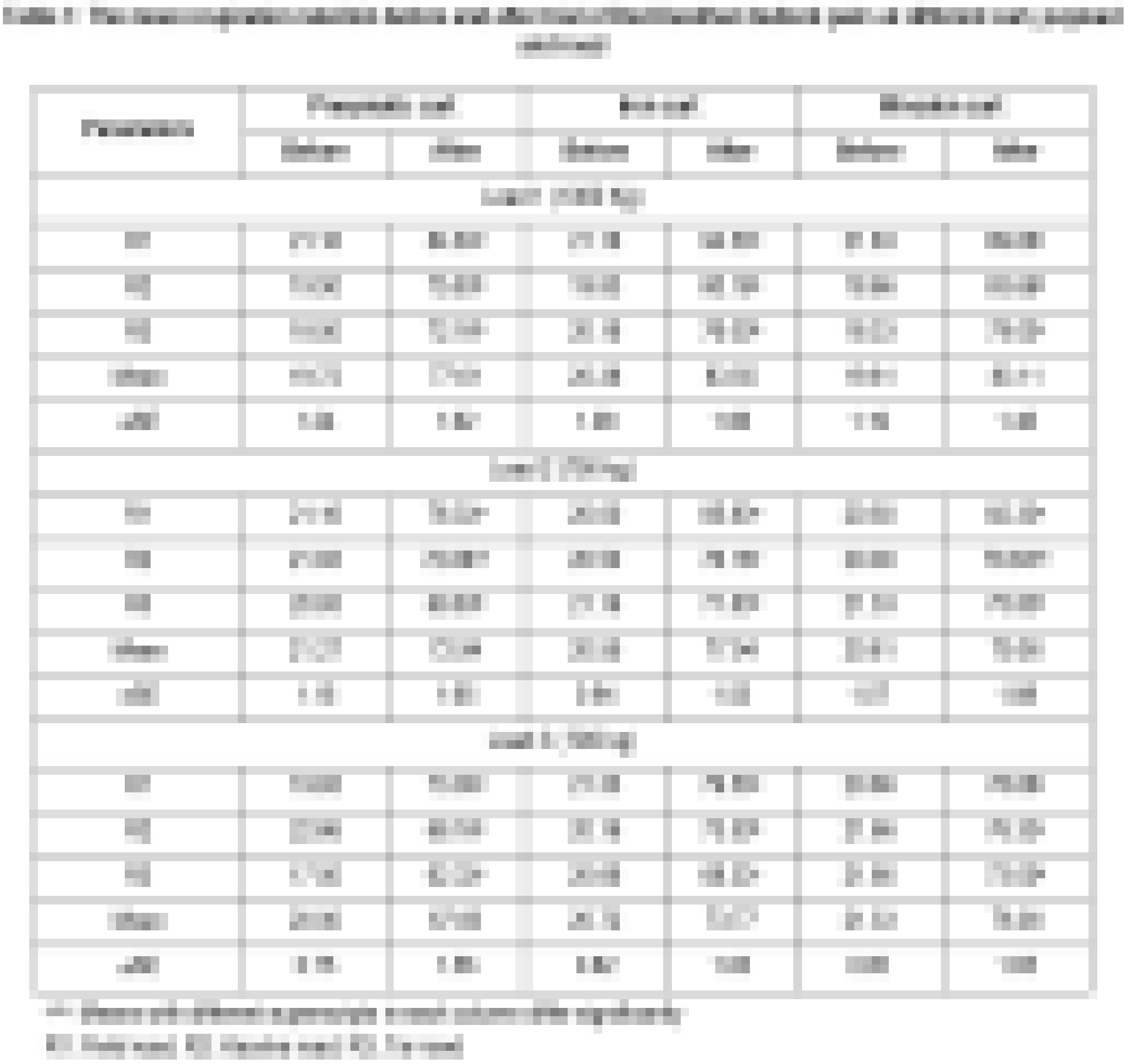
The overall mean respiration rate (breath/minute), heart rate (beats/min) and rectal temperature (°C) of Red Kandhari bullocks before and after trial with different cart at different payload and road during carting operation are presented in Table 1-3. Statistical analysis revealed similar respiration rate before carting operation, which became highly significantly different (P<0.01) after carting operation for different load, road condition and cart. The data revealed that the respiration rate increased at load L1 than L2 and L3, and on road R1 as compared to R2 and R3 road conditions (Table 1). This might be due to higher exertion of bullocks under heavy load and decreased road conditions. Increase in pulse rate and respiration with duration of work and draught were due to higher metabolic rate and thermal stress to supply more energy to muscles and dissipate the heat load[1].

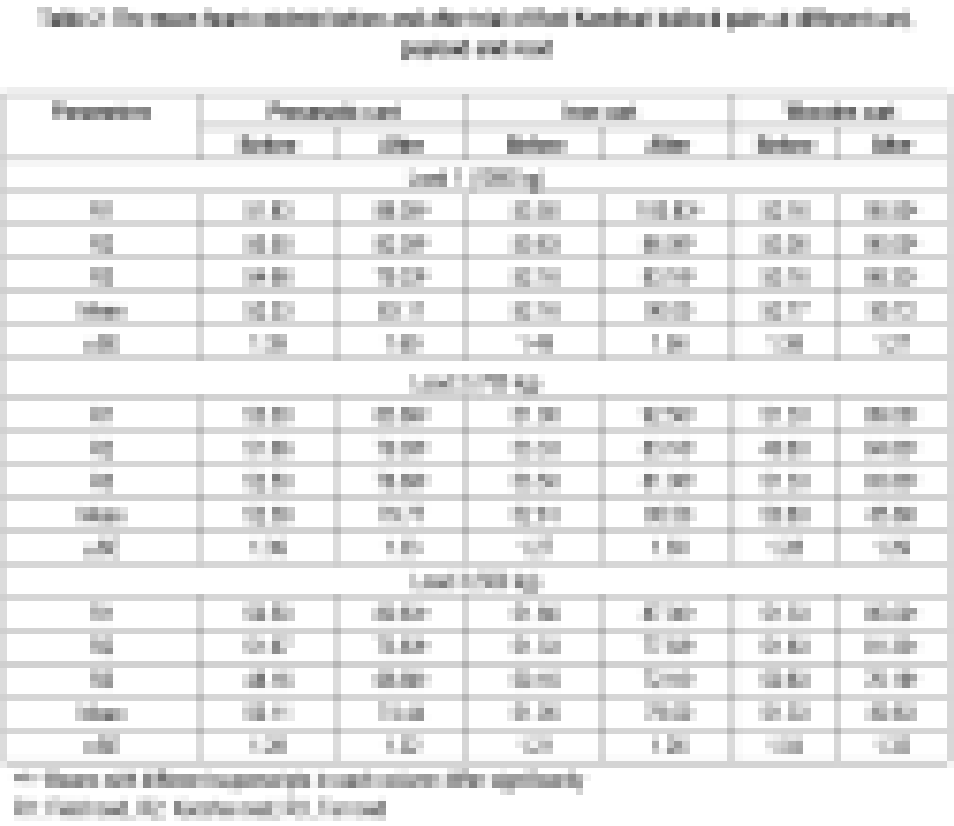
Heart rate also followed similar response pattern to loads and road conditions as that of respiratory rate (Table 2). However, there was only significant (P<0.05) differences for heart rate with wooden cart at load 2 on all road condition. The increase in the heart rate may be attributed to the well proven physiological hypothesis that carting exercise resulted in stress which in turn increases secretion of epinephrine, increasing oxygen demand and body temperature, leading to chemoreceptor stimulation[5].

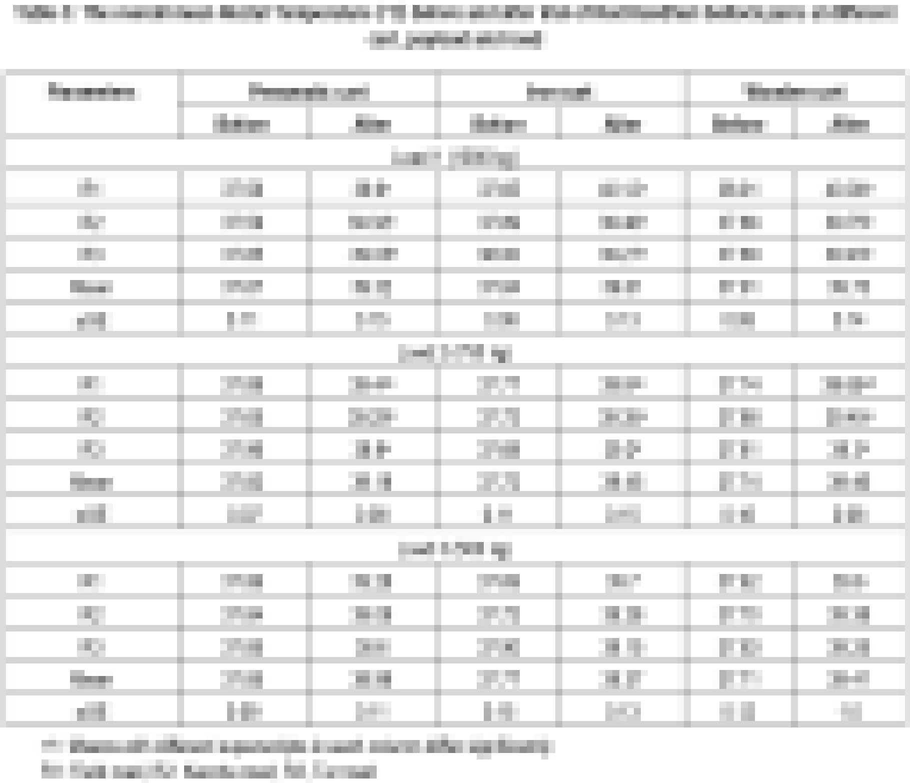
The analysis of variance for rectal temperature after carting operation with iron cart revealed highly significant (P<0.01) difference for both L1 (1000 kg) and L2 (750 kg) and no differences for L3 (500 kg). Similarly, highly significant (P<0.01) difference after the carting operation for L1 and L2 with wooden cart on all road condition were observed, whereas for L3 it did not differ (Table 3). The increase in body temperature from the initial level was more for heavy load (1000 kg) and on field road as compared to lower loads and kaccha and tar road conditions. This might be due to the cumulative effect of duration of work, draught and interaction of duration on body temperature of bullocks over the working period. The superiority of Red Kandhari bullock in carting ability with heavy loads might be due to their high heat tolerance ability and partly to low heat production during exercise. The uniform rise in the body temperature observed in the present study after carting operation indicates that Red Kandhari bullocks may have a strong physiological homeostasis even after exposure to different payloads and roads during carting operation. Our findings on physiological responses are in agreement with reports on crossbred bullocks[6-9], in Kankrej bullocks[7], in Red Kandhari bullocks[10], in Deoni bullocks[8, 11] and in Malvi bullocks[12].

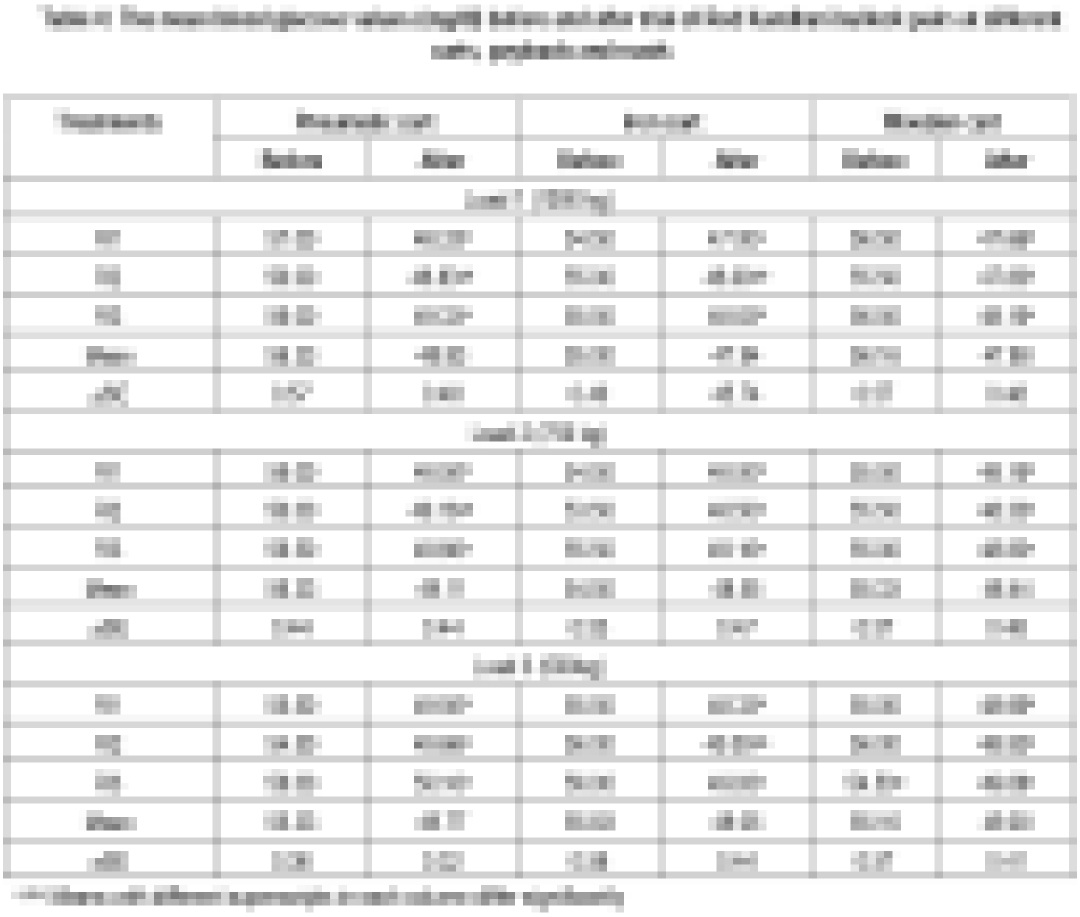
Blood glucose

The blood glucose level (mg/dl) for Red Kandhari bullocks before carting operation showed similar values irrespective of load and carting conditions (Table 4). But, its post carting level were significantly ($P<0.01$) decreased at load L1 and L2 for iron and wooden cart. The significant decline in the blood glucose level after carting operation in the present study indicate that the increased demand of energy required for different carting operation coupled with long duration of work and summer stress might have resulted into the decrease in the blood glucose level. In contrast to our observation, blood glucose level was not altered in Hariana bullocks working for continuous hours[13]. However, our finding is in agreement with values found in Kankrej[7], in Red Kandhari[10], Deoni[11] and HF crossbred bullocks[8].









CONCLUSION

The critical analysis of the observed values for bullocks for physiological responses of respiration rate, heart rate and rectal temperature and blood glucose level after the carting operation at different payloads with different load condition indicate that Red Kandhari bullocks has a good draft breed character.

REFERENCES

1. Alex, R., Singh, U., Alyethodi, R. R. and Deb, R. 2013. A review on draught animal research in India: constraints and future thrust areas. *Adv. Anim. Vet. Sci.* **1**(6): 178.
2. Sastry, N. S. R. and Thomas, C. K. 2005. Livestock Production Management, 4th Edition. Kalyani Publishers p 449.
3. Akilla, N. and Chander, M. 2009. Farmers attitude towards utilization of draught bullocks in Indian agriculture. *Livest. Res. Rural Dev.* **21**: 5.
4. Snedecor, G. W. and Cochran, W. G. (1994). Statistical Methods. Oxford and IBH Publishing Company. New Delhi, India.
5. Swenson M. J. 2005. Duke's Physiology of Domestic Animals, 12th edition. Panima Publishing Corporation, New Delhi, India.
6. Acharya, S., Mishra, M. and Nayak, J. B. 1979. Working capacity and behavior of crossbred versus non-descript indigenous bullocks under Orissa condition. *Indian J. Dairy Sci.* **32**: 37.

7. Dhangar, M. R. 1999. Investigation on draft performance and certain related aspects in Kankrej and cross bred bullocks. Ph.D. Thesis, Gujarat Agricultural University, Anand, India.
8. Yawatikar, P. V. 2001. Comparative studies of draftability power of indigenous and crossbred bullocks. Ph.D. thesis, Marathwada Agricultural University, Parbhani.
9. Singh, B. and Nanavati, S. 2013. Study on the physiological and haematological changes during the work performance of crossbred bullocks. *Haryana Vet.* **52**: 88.
10. Shelke, H. S. 2009. Evaluation of draught ability traits of Red Kandhari cattle. M.V.Sc. Thesis, Maharashtra Animal and Fishery Sciences University, Nagpur.
11. Atakare, S. P. 2009. Evaluation of draught ability traits of Deoni cattle. M.V.Sc. Thesis, Maharashtra Animal and Fishery Sciences University, Nagpur, India.
12. Singh, B., Nanavati, S. and Joshi, S. K. 2013. Study on the draughtability of Malvi bullocks. *Indian J. Field Vet.* **8**(4): 61.
13. Upadhyay, R. C. and Madan, M. L. 1988. Effect of work stress during different seasons on some haematological and biochemical constituents in bullocks. *Indian J. Dairy Sci.* **41**: 29.

★ ★ ★

KIND ATTENTION OF ESTEEMED CONTRIBUTORS

Authors are requested to furnish the following along with articles:

i. Processing fee of Rs. 300/-.
ii. One soft copy (CD/email) along with two hard copies of the article.
iii. Complete address of all the authors with email ID, Mobile no. & Life membership number.
iv. Prescribed certificate signed by all authors & Head of Department/ Institution.
v. Approval letter from the Institutional Ethics committee.