International Journal of Livestock Research, Vol. 11 (1) Jan' 2021
http://www.ijlr.org
eISSN: 2277-1964
NAAS Rating 2020 – 5.36

Original Research

Effect of Microclimate Alteration Devices and Feed Additive on Hematological Profile in Murrah Buffaloes

Ramya Narmeta[1]*, Ch. Hari Krishna[2] and N. Venumadhav[3]

[1]Department of Livestock Production Management, College of Veterinary Science, Rajendranagar, Hyderabad, Telangana, INDIA
[2]Professor (LPM), Dept. of Livestock Farming Complex, CVSc, Rajendranagar, Hyderabad, Telangana, INDIA
[3]PG scholar, Dept. of Veterinary Anatomy, CVSc, Rajendranagar, Hyderabad, Telangana, INDIA

*Part of M.V.Sc thesis submitted to PVNR Telangana Veterinary University in 2016

*Corresponding Author: ramyanarmeta@gmail.com

How to cite this paper: Narmeta, R., Harikrishna, C., & Venumadhav, N. (2021). Effect of Microclimate Alteration Devices and Feed Additive on Hematological Profile in Murrah Buffaloes. *International Journal of Livestock Research*, 11(1), 145-148. http://dx.doi.org/10.5455/ijlr.20200917013428

Received : Sep 15, 2020
Accepted : Dec 27, 2020
Published : Jan 31, 2021

Abstract

The present study was carried out on twenty-four lactating Murrah buffaloes during summer months in 2016 in experimental sheds with or without microclimate alteration devices as four treatment groups (six buffaloes in each group) viz. foggers (T1), fans (T2), fans and feed additive (T3) and control group (C). Mean haemoglobin (Hb) levels were significantly (P<0.01) different and higher in C group of buffaloes followed by T3, T2 and T1 groups. Packed cell volume (PCV) and total erythrocyte count (TEC) were higher in C group followed by T2, T3 and T1 group animals. Mean total leukocyte count and erythrocyte indices including mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH) and mean corpuscular haemoglobin concentration (MCHC) did not differ significantly among the groups. Neutrophils (%) were higher in T3 group followed by T1, T2 and C group animals, whereas lymphocytes (%) were higher in C group followed by T2, T1 and T3 group animals. Monocytes and Eosinophils did not differ significantly.

Keywords: Buffaloes, Fans, Feed Additive, Foggers, Hematological Profile

Introduction

Buffaloes have poor heat tolerance capacity compared to other domestic ruminants (Moran, 1973), and are more prone to heat stress due to scarcely distributed sweat glands, dark body colour and sparse hair on body surface (Das *et al.,* 1999; Khongdee *et al.,* 2013) which reduce the capacity of cutaneous evaporation (Gudev *et al.,* 2007). An imbalance between metabolic heat production inside the animal body and its dissipation to the surroundings results in heat stress under high air temperature and humid climates. To the changing climate, homeotherms generally adapt compensatory (thermoregulatory) mechanisms directed at maintaining or restoring thermal balance (West, 1999) and this adaptability results in changes in physiological, haematological, biochemical, hormonal, behavioural, production and reproduction aspects. Heat stress has an effect on haematological profile (Pandey *et al.,* 2013).

Materials and Methods

A study was conducted on the haematological profile of twenty-four lactating Murrah buffaloes available at Livestock Research Station, Mamnoor, Warangal district, Telangana during the summer months in 2016. The research station is situated 290 meters above the mean sea level on 17.9 ^{0}N Latitude and 79.59 ^{0}E Longitude. The average annual rainfall is around 550 mm. The climate of the area is typically tropical with average temperature ranging from 15-46°C and 38% to 59% RH. All the buffaloes were maintained under standard feeding and managemental conditions. The buffaloes were housed in four different treatment groups (six in each group) viz. foggers (T1) operated from 12.00 noon to 3.00 pm, fans (T2), fans and feed additive in the form of Chromium supplement and yeast culture as an anti-stress agent @ 500g/tonne of feed (T3) and control group of buffaloes were housed under loose housing system (C).

Blood samples (2 ml) were collected twice from the jugular vein of all the experimental animals, prior to the morning feeding once before the start of feeding trial and the other at the end of the experiment into vacutainers containing disodium salt of EDTA @ 2 mg/ml as anticoagulant under aseptic conditions. The blood samples were labelled, stored and transported in cooling box maintained at 2-8°C to the laboratory for further investigation. Hemoglobin concentration (Hb, g/dl), hematocrit value (PCV, %), total erythrocyte count (TEC, x10^6/mm^3), total leucocyte count (TLC, x10^3/mm^3), leukocyte cell types (%) and erythrocyte indices *viz*., mean corpuscular volume (MCV, %), mean corpuscular haemoglobin (MCH, %) and mean corpuscular haemoglobin concentration (MCHC, %) were analyzed using Aautomatic haemo-analyser.

Statistical analysis of data was carried out according to the procedures suggested by Snedecor and Cochran (Analysis of variance was utilized to test the significance of various treatments).

Results and Discussion

1. Effect on Haemoglobin (Hb)

The mean haemoglobin levels in C, T1, T2 and T3 groups of buffaloes were 13.22±0.66, 9.32±0.34, 10.57±0.13 and 10.77±0.63 g%, respectively. Mean Hb levels were significantly ($P<0.01$) different and higher in C group of buffaloes followed by T3, T2 and T1 groups. In the present study, significantly ($P<0.01$) higher Hb in C group of Murrah buffaloes could be due to haemo-concentration due to loss of fluids as no microclimate alteration devices are there in the shed. These results were consistent with the findings of Toharmat *et al.* (1998), Iqbal (2013) and Parmar *et al.* (2013).

2. Effect on Packed Cell Volume (PCV)

The mean packed cell volume was 40.0±2.28, 28.3±1.73, 31.6±0.61 and 31.1±2.15 % in C, T1, T2 and T3 groups of Murrah buffaloes, respectively and differed significantly ($P<0.01$). PCV was higher in C group followed by T2, T3 and T1 groups of buffaloes and this could be due to haemo-concentration of the blood due to loss of fluids due to ambient heat present during summer as no microclimate alteration devices are there in the shed Similar results were observed by Toharmat *et al.* (1998) and Parmar *et al.* (2013). While, Koubkova *et al.* (2002) found significant ($P<0.05$) increase in hematocrit value during high ambient temperatures and Omar *et al.* (1996) found that hematocrit value was reduced by cooling.

3. Effect on Total Erythrocyte Count (TEC)

The mean total erythrocyte count for C, T1, T2 and T3 groups of buffaloes were 4.72±0.26, 3.37±0.11, 3.67±0.02

and 3.80±0.19 (10^6/µl), respectively which were significantly (P<0.01) different. Mean TEC was higher in C group followed by T3, T2 and T1 groups of buffaloes and this could be due to adequate nutrient availability required for Hb synthesis. These results were consistent with the findings of Koubkova *et al.* (2002), Iqbal (2013) and Parmar *et al.* (2013). Whereas, Omar *et al.* (1996) found that red blood cell number were reduced by cooling.

4. Effect on Total Leukocyte Count (TLC)

The mean total leukocyte count were 8.62±0.59, 6.17±0.86, 8.03±1.56 and 7.52±0.52 (10^3/µl) in C, T1, T2 and T3 groups of Murrah buffaloes, respectively. Present study revealed that TLC was relatively higher in C and T2 group of Murrah buffaloes followed by T3 and T1 groups and differed non-significantly. Higher TLC in C and T2 group of buffaloes could be due to thyromolymphatic involution or destruction of erythrocytes as a result of heat stress. Abdel Samee (1987) also observed increased leukocyte count by 21-26% in farm animals under thermal stress. Similar findings were given by Omran *et al.* (2011) and Das *et al.* (2014).

5. Effect on Erythrocyte Indices

In the present study, effect of different experimental groups on erythrocyte indices including Mean corpuscular volume (MCV), Mean corpuscular haemoglobin (MCH) and Mean corpuscular haemoglobin concentration (MCHC) were assessed and presented in Table 1. The mean MCV obtained for C, T1, T2 and T3 groups were 84.77±0.48, 83.81±3.08, 86.39±1.85 and 81.68±2.38 %, respectively. The mean MCH recorded for C, T1, T2 and T3 groups were 28.07±0.23, 27.66±0.45, 28.82±0.38 and 28.28±0.31 %, respectively. Whereas, the mean MCHC for C, T1, T2 and T3 groups were 33.11±0.32, 33.18±1.07, 33.40±0.42 and 34.71±0.65 %, respectively. The difference among the buffaloes kept under different microclimatic conditions was statistically non-significant. These changes may be due to elevated levels of Hb, PCV and TEC in C group of buffaloes.

6. Effect on Differential Leukocyte Count (DLC)

Differential leukocyte count (DLC) consists of Neutrophils (%), Eosinophils (%), Lymphocytes (%), Monocytes (%) and Basophils (%) which has been presented in Table 1 excluding Basophil (%) since there was zero basophil count in all the four groups.

Table 1: Effect of microclimate alteration devices and feed additive on haematological profile in Murrah buffaloes

Experimental groups		Hb (g%)	PCV (%)	TEC (10^6/µl)	TLC (103/µl)	MCV (%)	MCH (%)	MCHC (%)	Neutrophils (%)	Eosinophils (%)	Lymphocytes (%)	Monocytes (%)
Control (C)	Mean± SE	13.22b ± 0.66	40.00b ±2.28	4.72b ±0.26	8.62 ±0.59	84.77 ±0.48	28.07 ±0.23	33.11 ±0.32	55.67a ±2.65	2.33 ±0.21	37.00b±1.83	4.5±0.5
Foggers (T1)	Mean± SE	9.32a ±0.34	28.33a ±1.73	3.37a ±0.11	6.17 ±0.86	83.81 ±3.08	27.66 ±0.45	33.18 ±1.07	63.00ab ±1.1	2.33 ±0.21	30.00ab±1.32	4.67±0.21
Fans (T2)	Mean± SE	10.57a ±0.13	31.67a ±0.61	3.67a ±0.02	8.03 ±1.56	86.39 ±1.85	28.82 ±0.38	33.4 ±0.42	60.33ab ±3.11	2± 0.37	33.00ab±2.99	4.67±0.21
Fans+ (T3) Feed additive	Mean± SE	10.77a ±0.63	31.17a ±2.15	3.80a ±0.19	7.52 ±0.52	81.68 ±2.38	28.28 ±0.31	34.71 ±0.65	66.33b ±2.79	2.33 ±0.21	27.33±2.84	4±0

Present study revealed that the mean values of neutrophils in C, T1, T2 and T3 groups of buffaloes were 55.67±2.65, 63.00±1.10, 60.33±3.11 and 66.33±2.79 %, respectively which differed significantly (P<0.05). Neutrophils % were higher in T3 group followed by T1, T2 and C groups. Similarly, significant (P<0.001) difference was observed in treatment group of buffaloes under hot-dry season (Das *et al.*, 2014). The mean values of eosinophils in C, T1, T2 and T3 groups of buffaloes were 2.33±0.21, 2.33±0.21, 2.00±0.37 and 2.33±0.21 %, respectively which did not differ significantly. While, the mean values of monocytes in C, T1, T2 and T3 groups of buffaloes were 4.50±0.50, 4.67±0.21, 4.67±0.21 and 4.00±0.00 %, respectively which also did not differ significantly among the experimental groups of buffaloes. The mean values of lymphocytes in C, T1, T2 and T3 groups of buffaloes were 37.00±1.83, 30.00±1.32, 33.00±2.99 and 27.33±2.84 %, respectively and differed significantly (P<0.05). Lymphocytes (%) were higher in C group followed by T2, T1 and T3 groups. Similarly, significant (P<0.05) difference was observed by Das *et al.* (2014) in T_0 (control) group than T_1 group (provided with niacin, yeast, mustard oil, curtains and mist fans).

Conclusion

Some of the microclimate alteration devices and supplemented feed additive had significant counter acting effect

on heat stress thus resulted in alteration of some parameters of haematological profile in Murrah buffaloes.

Conflict of Interests

There is no conflict of interest.

Publisher Disclaimer

IJLR remains neutral concerning jurisdictional claims in published institutional affiliation.

References

1. Abdel Samee, A. M. (1987). *The role of cortisol in improving productivity of heat-stressed farm animals with different techniques*. Ph.D. Thesis, Faculty of Agriculture, Zagazig University, Zagazig, Egypt.
2. Das, K. S., J. K. Singh, G. Singh, R. C. Upadhyay, R. Malik, P. S. Oberoi. (2014) Heat stress alleviation in lactating buffaloes: Effect on physiological response, metabolic hormone, milk production and composition**.** *Indian Journal of Animal Sciences,* 84(3).
3. Das, S. K., Upadhyaya, R. C. and Madan, M. L. (1999). Heat stress in Murrah buffalo calves. *Livestock Production Science,* 61: 71-78.
4. Gudev, D., Popova Ralcheva, S., Moneva, P., Aleksiev, Y., Peeva, T., Penchev, P. and Ilieva, I. (2007). Physiological indices in buffaloes exposed to sun. *Archiva* zootechnica,10**:** 1-7.
5. Iqbal Saleem. (2013). Effect of seasons on the blood physiology of cross-bred cattle in Kashmir. XXII Annual Conference of Society of Animal Physiologists of India and National Symposium on Physiological and Nutri-genomic interventions to augment. Food Security and Animal Welfare. Nov. 19-21 (Abstr.)
6. Khongdee, T., Sripoon, S., Vajrabukka, C. (2013). The effects of high temperature and roof modification on physiological responses of swamp buffalo (Bubalus bubalis) in the tropics. *International Journal of Biometeorology,* 57: 349-354.
7. Koubková, M., Knížková, I., Kunc, P., Härtlová, H., Flusser, J., Doležal, O. (2002). Influence of high environmental temperatures and evaporative cooling on some physiological, hematological and biochemical parameters in high yielding dairy cows. *Czech Journal of Animal Science,* 47(8): 309-318.
8. Moran, J. B. (1973) Heat tolerance of Brahman cross, buffalo, bauteng and shorthorn steers during exposure to sun and as a result of exercise. *Australian Journal of Agriculture Research,* 24: 775-782.
9. Omar, E. A., Kirrella, A. K., Fawzy, S. A., El-Keraby, F. (1996). Effect of water spray followed by forced ventilation on some physiological status and milk production of post-calving Friesian cows. *Alexandria* Journal *of Agriculture Research,* 41: 71-81.
10. Omran Fayza, I., Ashour, G., Youssef, M. M. and Shafie, M. M. (2011). Responses of hematology, blood metabolites, mineral ions and hormonal profile to heat stress for Egyptian buffalo-calves. *Egyptian Journal* of *Agricultural Research,* 89(3): 1129-1138.
11. Pandey, A. K., Khan, J. R. and Chandrakar Khushboo. (2013). Sahiwal cows during hot dry and hot humid environments: Changes in physiohematological and hormonal parameter in lactating cows. XXII Annual Conference of Society of Animal Physiologists of India and National Symposium on Physiological and Nutri-genomic interventions to augment. Food Security and Animal Welfare. Nov. 19-21 (Abstr.).
12. Parmar Mehtab Singh, Madan, A. K., Rastogi, S. K., Huozha Ruokuobeinuo. (2013). Comparative study of seasonal variations on hematological profile in Sahiwal cows (*Bos Indicus*) and Murrah buffalo (*Bubalus Bubalis*). *Journal of Animal Research,* 3(2): 167-171.
13. Snedecor, G. W. and Cochran, W. G. (1994). Statistical methods. 8th edition, Iowa State University Press, Ames, Iowa, USA- 50010.
14. Toharmat, T., Nonaka, I., Shimizu, M., Batajoo, K. K., Kume, S. (1998). Effects of prepartum energy intake and calving season on blood composition of periparturient cows. *Asian Australasian Journal of Animal Sciences,* 11: 739-745.
15. West, J. W. (1999). Nutritional strategies for managing the heat-stressed dairy cow. *Journal of Animal Science,* 2: 21-35.

****