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## **Effect of managemental conditions like housing systems and levels of feeding on physiological parameter included rectal temperature, respiration rate and heart rate in Murrah buffalo calves in hot-humid weather**

**Shiv Kumar, Harish K Gulati, Harish Rohila and Amar Shroha**

### **Abstract**

An experiment was conducted on 24 Murrah buffalo calves of either sex between 6 to 9 month of age at animal Farm, LUVAS, Hisar during summer season from July 15, 2015 to October 15, 2015 (90Days). Experimental calves were Devided into four treatments having six animals in each treatment *viz.* Loose housing system + 100% feeding level (T1), Loose housing system + 120% feeding level (T2), Conventional barn housing system + 100% feeding level (T3) and Conventional barn housing system + 120% feeding level (T4). There was significantly higher ( $p<0.05$ ) temprature and temprature humidity index in conventional house than loose house. The analysis of variance revealed that there was no significant differences in rectal temperature, respiration rate and heart rate (per minute) of all treatments during the whole duration of experiment. Housing systems and level of feeding have no effect on average rectal temperature, respiration rate and heart rate.

**Keywords:** Murrah buffalo calves, rectal temperature, respiration rate, heart rate, loose housing system

### **Introduction**

Buffaloes have immense agricultural importance by virtue of their high production potential through meat and milk for mankind besides being a source of sustenance to the poor and marginal farmers as well as landless labourers in the developing world. Buffalo is a triple purpose animal, being suitable for milk, meat and draught. Buffalo can efficiently utilize the roughages and crop by-products into high quality milk suitable for a wide range of dairy products. Buffaloes are better converter of poor quality fibrous feeds into milk and meat. Some workers have also demonstrated a better digestive ability of buffaloes than cattle to utilize poor quality roughage (Agarwal *et al.*, 2009) [1]. Exposure of buffaloes to the poor manage mental conditions in hot-humid weather evokes a series of drastic changes in the physiological functions that leads to depression in feed intake, efficiency and utilization, disturbances in metabolism of water, protein, energy and mineral balances, enzymatic reactions, hormonal secretions and blood metabolites. Such changes result in impairment of reproduction and productive performances. The heat stress affect the physiological systems governing thermal regulation and the maintenance energy of buffalo during extreme summer. In tropical and subtropical areas, high ambient temperature is the major constraint on animal productivity (Marai *et al.*, 2008) [3] and the effect of heat stress is aggravated when heat stress is accompanied with high humidity (Marai *et al.*, 2008) [3]. In India, not much of attention has been paid so far on this aspect. So, the present work was under taken to study the effect of manage mental conditions like types of housing systems and levels of feeding on physiological parameter like rectal temperature, respiration rate and heart rate in murrah buffalo calves in hot-humid weather.

### **Materials & Methods**

The experiment was conducted from 15<sup>th</sup> July 2015 to 15<sup>th</sup> October, 2015 at the Buffalo farm of Livestock Production Management Department, College of Veterinary Sciences, Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar.

Hisar city is situated in semi-arid region and climatic condition is sub-tropical in nature. Geographically, Hisar is situated at 29° 10' N latitude, 75° 40' E longitude and 215.2 meters altitude.

### Animals and experimental design

Twenty four Murrah buffalo calves of either sex between 6 to 9 month of age were selected from the Old Buffalo Farm, Livestock Production Management Department, LUVAS, Hisar. These calves were divided into four groups of six calves each on the basis of nearness of their weight. Prior to start of experiment an adjustment period of 10 days will be given to all the calves. The experiment groups were randomly allocated to one of the four treatments *viz.* Loose housing system + 100% feeding level (T1), Loose housing system + 120% feeding level (T2), Conventional barn housing system + 100% feeding level (T3) and Conventional barn housing system + 120% feeding level (T4). Feeding level were according to the ICAR recommendation.

### Feeding and watering

All the experimental calves were fed jowar during the experimental period. Wheat straw *ad libitum* and a concentrate mixture containing Barley, Ground Nut cake (GNC), Deoiled Rice Polish (DORP), Mineral mixture (MM) and Salt was prepared. The allowance of concentrate mixture was fixed in such a way that calves of T<sub>2</sub> and T<sub>4</sub> got 20 per cent higher and calves of T<sub>1</sub> and T<sub>3</sub> at normal ICAR recommendation level of concentrate per head per day. A weighted amount of Jowar was fed to all calves daily according to dry matter requirement of calves other than the dry matter present in the concentrate mixture. The Quantity of different feeds fed to each calf was adjusted at fortnightly intervals in order to meet the requirement of the calves with the change in their body weight. Animals were given *ad lib* fresh water throughout the experimental period. Before formulation of rations, the feed ingredients were analyzed (AOAC, 2005)<sup>[2]</sup> for proximate composition (Table 1). Based upon the proximate composition of feed ingredients, the ration for the different experimental groups of animals was formulated. The composition of the experimental diet of different treatment groups and proximate chemical composition is presented in (Table 2.).

### Observations

**Chemical Analysis of Feed Ingredients for Proximate Principles:** Analysis of chemical constituents of feed ingredients was done in the laboratory. All parameters like Total moisture, Crude proteins, Crude fibers, Total Ash and Ether extract were analyzed accurately by laboratory methods.

### Physiological Reaction

Rectal temperature, Respiration rate, Heart rate of all the calves were recorded at fortnightly interval at early morning during the experiment. Rectal temperature was recorded (in °C) by inserting clinical thermometer into the rectum for two minute taking all the precautions. Respiration rate was recorded by counting the movement of right flank (per minute count) of animal. Heart rate was recorded (beats/min) by the use of stethoscope by putting on the area of 1st to 3<sup>rd</sup> thoracic ribs.

### Statistical Analysis

The experiment data was planned and analyzed as per Snedecor and Cochran, 1999.

### Results and Discussion

The concept of animal adaptation refers to physiological changes taking place in an animal with respect to external and internal stimuli. The physiological response is the process of adjustment of the animal itself to other living material and to its external physical environment. Physiologist have used simple animal reaction like respiration, heart rate and body temperature to assess animal reaction to environment and evaluate animal comfort.

#### Rectal temperature

The average rectal temperature (°C) of each treatment fortnightly have been presented in Table 3 and 4. The mean overall rectal temperature recorded in treatments T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub> in Initial to 6<sup>th</sup> fortnight have been presented in Table 3 respectively. The average rectal temperature (°C) in loose house, Conventional barn, ICAR 100%, ICAR 120% from initial to 6<sup>th</sup> fortnight have been presented in Table 4 respectively. The analysis of variance revealed that there was no significant difference in rectal temperature of all treatments during the whole duration of experiment. Housing systems and level of feeding have no effect on average rectal temperature.

#### Respiration rate

The average Respiration rate (per minute) of each treatment fortnightly have been presented in Table 5 and 6. The mean overall Respiration rate (per minute) recorded in treatments T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub> in Initial to 6<sup>th</sup> fortnight have been presented in Table 5 respectively. The average respiration rate (per minute) in loose house, Conventional barn, ICAR 100%, ICAR 120% in Initial to 6<sup>th</sup> fortnight have been presented in Table 6 respectively. The analysis of variance revealed that there was no significant difference in Respiration rate (per minute) of all treatments during the whole duration of experiment. Housing systems and level of feeding have no effect on average respiration rate.

#### Heart rate

The average Heart rate (per minute) of each treatment fortnightly have been presented in Table 7 and Table 8. The mean overall Heart rate (per minute) recorded in treatments T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub> in Initial to 6<sup>th</sup> fortnight have been presented in Table 7 respectively. The average Heart rate (per minute) in loose house, Conventional barn, ICAR 100%, ICAR 120% in Initial day to 6<sup>th</sup> fortnight have been presented in Table 8 respectively. The analysis of variance revealed that there was no significant difference in Heart rate (per minute) of all treatments during the whole duration of experiment. Housing systems and level of feeding have no effect on average heart rate.

**Table 1:** Chemical analysis of feed ingredient (on DM basis)

Ingredients	DM%	OM%	CP%	CF%	EE%	ASH%	NDF%	ADF%	NFE%
Barley	92.06	89.71	10.5	7.02	3.5	2.3	24.23	8.71	76.7
GNC	92.72	85.74	39.16	8.12	8.31	7.1	23.07	10.12	37.54
DORP	90.07	83.61	14.5	13.09	2.1	6.41	49.23	16.13	64.1
Sorghum	25	14.32	7.45	27.01	3.4	10.73	64.87	37.84	51.45
Wheat Straw	90	78	2.81	35	1.05	12.16	74.83	51.9	49.14

**Table 2:** Ingredients of concentrate mixture (kg) and its chemical composition (on DM basis).

Ingredients	Quantity in kg	DM%	OM%	CP%	CF%	EE%	ASH%	NDF%	ADF%	NFE%
Barley	40	36.8	35.88	4.2	2.8	1.4	0.92	9.692	3.484	30.68
GNC	30	27.81	25.71	11.748	2.4	2.49	2.1	6.921	3.036	11.262
DORP	27	24.3	22.572	3.915	3.51	0.54	1.728	13.2921	4.3551	17.307
Whole conc.	100	88.91	84.162	19.863	8.71	4.43	4.748	29.9051	10.8751	59.249

Whole concentrate mixture also Contain 2 kg Mineral mixture (MM) and 1kg Salt.

**Table 3:** Average Change in rectal temperature (°C) of buffalo calves fortnightly in different treatments.

Fortnights	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>
0	37.981±0.130	38.009±0.172	38.264±0.085	38.019±0.129
1	38.056±0.105	38.157±0.153	38.151±0.130	38.204±0.151
2	38.241±0.161	38.204±0.150	38.372±0.064	38.111±0.127
3	38.250±0.150	38.398±0.080	38.493±0.052	38.407±0.095
4	38.157±0.097	38.278±0.111	38.460±0.096	38.481±0.103
5	38.556±0.119	38.611±0.140	38.634±0.081	38.611±0.095
6	38.833±0.070	38.787±0.104	38.560±0.097	38.722±0.091

**Table 4:** Effect of Housing System and level of feeding on rectal temperature (°C) at fortnightly interval.

Fortnights	Housing System		Feeding Level	
	Loose house	Conventional barn	100% ICAR	120% ICAR
0	37.995±0.083	38.141±0.078	38.123±0.062	38.014±0.074
1	38.106±0.097	38.178±0.081	38.104±0.084	38.181±0.119
2	38.222±0.079	38.242±0.048	38.307±0.083	38.157±0.087
3	38.324±0.097	38.450±0.048	38.371±0.083	38.403±0.078
4	38.218±0.071	38.471±0.039	38.309±0.061	38.380±0.063
5	38.583±0.108	38.623±0.081	38.595±0.062	38.611±0.097
6	38.810±0.069	38.641±0.072	38.697±0.050	38.755±0.064

**Table 5:** Change in Respiration rate (per minute) of buffalo calves fortnightly in different treatments.

Fortnights	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>
0	18.670±1.687	18.830±0.792	21.330±3.073	18.000±1.461
1	21.000±1.571	18.330±1.453	16.670±1.116	20.830±2.810
2	20.670±3.073	22.170±1.447	23.170±3.535	19.170±1.195
3	26.000±2.477	24.000±2.422	25.000±2.852	25.000±2.066
4	31.670±3.712	29.670±2.565	28.670±2.789	33.000±4.374
5	37.170±4.408	30.670±2.883	30.330±3.007	38.170±3.497
6	40.830±2.892	43.330±1.961	38.830±2.104	45.670±2.499

**Table 6:** Effect of Housing System and level of feeding on Respiration rate (per minute) at fortnightly interval.

Fortnights	Housing System		Feeding Level	
	Loose House	Conventional Barn	100% ICAR	120% ICAR
0	18.750±0.655	19.670±1.453	20.000±1.880	18.420±0.831
1	19.670±1.256	18.750±1.476	18.830±1.138	19.580±1.650
2	21.420±2.035	21.170±1.918	21.920±2.010	20.670±0.679
3	25.000±0.904	25.000±1.693	25.500±1.954	24.500±1.718
4	30.670±1.174	30.830±1.631	30.170±1.333	31.330±2.205
5	33.920±2.382	34.250±2.889	33.750±3.021	34.420±1.993
6	42.080±1.193	42.250±1.736	39.830±2.275	44.500±1.683

**Table 7:** Change in Heart rate (beats/minute) of buffalo calves fortnightly in different treatments.

Fortnights	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>
0	67.000±1.732	66.830±1.579	68.330±1.382	65.670±1.333
1	65.500±2.291	67.670±0.955	67.830±1.078	70.170±1.138
2	70.170±1.249	63.500±3.170	69.670±2.390	70.000±1.549
3	70.170±1.833	71.830±2.626	71.500±2.592	72.170±1.797
4	73.670±2.418	71.330±2.275	73.500±2.029	73.670±3.211
5	82.170±3.825	80.670±5.077	79.830±3.978	74.330±1.430
6	79.670±2.155	86.830±5.224	80.000±4.227	82.830±2.301

**Table 8:** Effect of Housing System and level of feeding on Heart rate (per minute) at fortnightly interval.

Fortnights	Housing System		Feeding Level	
	Loose House	Conventional Barn	100% ICAR	120% ICAR
0	66.920±1.060	67.000±0.876	67.670±0.628	66.250±1.195
1	66.580±1.599	69.000±0.671	66.670±1.370	68.920±0.638
2	66.830±1.406	69.830±1.181	69.920±1.114	66.750±1.838
3	71.000±1.853	71.830±1.526	70.830±1.956	72.000±1.742
4	72.500±1.466	73.580±2.289	73.580±1.375	72.500±2.665
5	81.420±2.451	77.080±1.357	81.000±2.952	77.500±2.217
6	83.250±2.394	81.420±2.371	79.830±2.542	84.830±2.860

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