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Study on effect of different physiological states on cardio-respiratory response and nutrient utilization in Murrah buffaloes

Om Prakash and KVK Gonda

Abstract
Experiments were conducted with the animals maintained at the Livestock Farm of N.D. University of Agriculture and Technology, Kumarganj, Faizabad. A total of sixty animals were used in this study. The animals were divided into six groups consisting of ten animals each according to their physiological state, viz., calves under one year of age, 1 to 2 year, 2-3 years, non-pregnant, non-lactating, non-pregnant lactating and pregnant non-lactating. The animals were fed wheat straw and concentrate mixture as per ICAR (1985) recommendation. The vital physiological reactions, viz., respiration and pulse rate were examined and recorded in different physiological states of Murrah buffaloes. Significantly higher respiration and pulse rate were observed in calves under one year of age. The morning values of physiological reactions were lower than the evening values in all the categories of animals. Cardio-respiratory response in pregnant and lactating animals were significantly higher (p) than in non-pregnant and non-lactating animals. Highly significant difference (p) in dry matter consumption was observed by the experimental buffaloes among the different physiological states of the animals. In the present study D.M. digestibility was significantly higher in young calf and lactating animals. The environment depends both on the increase of the inherent levels of resistance. Removal of the main constraints viz., summer stress, poor nutrition and management practices. In this climatic zone, work on the mechanism by which high environmental temperature reduces appetite might give a lead to the facts that how this major restriction on productivity can be overcome. Appropriate nutrition and management system is important for high productivity to enhance to tolerance against heat, disease and parasitic infestation.

Keywords: Buffalo, lactating cardio-respiratory, young calf, stress, pulse

Introduction
The domestic buffalo also known as Asian Animal plays an important role in the farmers economic life being an integral part of the farming system. Indian domestic buffaloes which are commonly known as water buffaloes have been domesticated in India for milk and meat production. It is economically important in this region and could be used a small tractor for farmers and its meat and milk are rich in nutrients. Tropical environment with high temperature and humidity can cause low productivity of animals even under ideal conditions of nutrition. Such detrimental climatic effect on the animals may be exerted directly through its effect on physiological system of the animal or indirectly through their changed nutritional status. Under stress condition the respiration rate and body temperature rises [1]. Very little systematic work in buffaloes on nutrient utilization and nitrogen balance in different seasons of the year have been reported either in India or in foreign countries [2]. For improvement of buffalo performance under different climatic condition at different geographic regions it is necessary first to assess the impact of the micro-environment on various systems directly or

indirectly related to growth, production and reproduction with other related ancillary physiological activities.

Material and Methods

Total sixty animals were used from the stock of Live Stock Farm of Narendra Deva University of Agriculture and Technology, Narendra Nagar (Kumarganj), Faizabad (Ayodhya) for this study. The animals were divided in to six groups consisting of 10 animals. Each according to their physiological state viz.Calves under one year age, 1-2 years, 2-3 years, Non-lactating Non-pregnant, Non-pregnant Lactating and Pregnant Non-lactating. All the animals were maintained under conventional farm management conditions. Various physiological responses were measured at 4 hour and 16 hours a day for 6 consecutive days in various groups of animals. The following observations were made i.e. Body temperature, Respiration rate, Pulse rate, Feed consumption and Dry matter digestibility.

The animals were fed as per requirements. All the observations were recorded when the animals were in resting stage under shade. All the animals were maintained under conventional farm management conditions. The experimental animals were fed as per ICAR feeding standards (1985). Metabolism trials were conducted in all the seasons for 7 day duration to assess the nutrient intake and to measure their digestibility coefficient. The observations were made viz. Feed consumption, digestibility of various nutrients, nitrogen balance and Cardio-respiratory response.

Feeding was carried out for six weeks and there after a metabolism trial was conducted. During metabolism trial, fresh and clean water was provided to the animals. An accurate record of feed and water intake, faeces and urine excretion was maintained. Samples of concentrate mixture, wheat straw, sudan hybrid and residues were taken for estimation of dry matter and proximate principles. Methods of analysis given in A.O.A.C [3] were followed for proximate principles of feed. The statistical analysis of the data was done by the methods described [4].

Result and discussion

Table 1: Effect of season on dry matter consumption

S. No.	Age and physiological state of buffalo	Body weight (Kg)	Metabolic body weight (Kg)	DM intake (Kg)	DM intake per 100 kg body weight	DM intake per Kg metabolic body size (gm)
1	Under 1 year	63.60± 0.94	22.52± 0.25	1.31±0.03	2.06±0.01	58.47±0.57
2	1 -2 year	125.75±0.95	37.55±0.21	3.28± 0.01	2.61± 0.01	87.49± 0.18
3	2-3 year	174.95±1.11	48.10± 0.23	4.17± 0.03	2.38± 0.01	86.59±0.36
4	Non- pregnant, non-lactating	275.50±1.00	67.62±0.19	6.34±0.06	2.30± 0.01	93.79± 0.63
5	Non- pregnant lactating	415.55± 1.59	92.04±0.18	12.18±0.08	2.93± 0.01	132.34± 0.64
6	Pregnant non lactating	505.40±1.06	106.59± 0.17	12.24±0.05	2.42± 0.01	114.78± 0.34

Table 2: Analysis of variance of the data on body weight in different physiological state of Murrah buffalo

Source of variation	D.F.	SS	MSS	Fc	CD value at	
					5%	1%
Between	5	1484866.437	296973.287	27944.33**	0.92	1.22
Error	54					
Total	59					

** Significant at 1% level ($p < 0.01$)

The above data revealed highly significant difference ($P< 0.01$) in body weight in different physiological states of buffalos.There was significant difference (p)in DM digestibility among different physiological groups of animals. There are various factors which affect the dry matter intake and its digestibility such as type, age, sex and stage of production and reproduction of animals. Very young and very old animals are usually less efficient to their digestion of fibrous food. Young calves and lactating animals required more energy for growth and production of milk. In the above studies D.M. digestibility was significantly higher in young calf and lactating animals. Similar reports have been given by Banerjee [5] and Verma [6].

Digestibility Co- efficient of dry matter

Table 3: Dry matter digestibility in different physiological state of Murrah buffalo

S. No.	Age and physiological state of buffalo	Total DM intake (g)	Dry matter voided in faeces (g)	Dry matter digested (g)	Digestibility coefficient
1	Under 1 year	1311± 25.33	298.70± 2.73	1008.30± 24.02	76.85± 0.42
2	1-2 year	3285± 13.68	1452.50± 4.57	1832.50± 13.04	55.78± 0.20
3	2- 3 year	4166± 32.04	1861.80± 3.73	2304.20± 28.68	55.06± 0.35
4	Non pregnant, non- lactating	6343± 55.47	2968.60± 3.96	3374.40± 51.61	53.17± 0.36
5	Non pregnant, lactating	12181± 77.14	5009.80± 4.96	7201.20±81.35	59.10± 0.36
6	Pregnant non-lactating	12235± 51.87	5821± 3.47	6414.00± 48.57	53.22± 0.77

Table 4: Analysis of variance of the data of the digestibility coefficient of dry matter of Murrah buffalos

Source of variation	D.F.	SS	MSS	Fc	CD value at	
					5%	1%
Between	5	4118.483	823.696	414.375**	1.62	2.15
Error	54	107.342	1.987			
Total	59	4225.826				

** Significant at 1% level ($p < 0.01$)

Statistical analysis of data showed significance difference ($P<0.01$) indigestibility of dry matter among different physiological groups of animals. Significantly higher dry matter digestibility was observed in animal under 1 year of age than other category of animals. However the animal belongs to other category did not differ from each except non-pregnant lactating animals.

There was significant difference (p)in DM digestibility among different physiological groups of animals. There are various factors which affect the dry matter intake and its digestibility such as type, age, sex and stage of production and reproduction of animals. Very young and very old animals are usually less efficient to their digestion of fibrous food. Young calves and lactating animals required more energy for growth and production of milk. In the above studies D.M. digestibility was significantly higher in young calf and lactating animals. Similar reports have been given by Banerjee [5] and Verma [6].

Table 1: Effect of age and physiological condition on respiration and pulse rate of Murrah buffalo

S. No.	Age and physiological states of Murrah buffalo	Respiration rate (per minute)		Pulse rate (per minute)	
		4.00 hours	16 hours	4.00 hours	16 hours
1	Under 1 year	30.70± 0.34	35.20± 0.20	44.90± 0.28	46.30± 0.21
2	1-2 year	28.80± 0.25	33.40± 0.27	44.00± 0.26	45.20± 0.25
3	2-3 year	24.90± 0.23	32.40± 0.16	43.10± 0.23	42.80± 0.36
4	Non pregnant non lactating	23.0± 0.39	32.40± 0.34	42.00± 0.26	42.10± 0.23
5	Non pregnant lactating	25.40± 0.96	31.60± 0.34	44.80± 0.65	45.20± 0.49
6	Pregnant non lactating	29.10± 0.51	34.40± 0.22	44.30± 0.26	47.20± 0.20
F Value		79.84	26.61	9.94	33.54
CD value at 5%		1.22	0.96	1.30	1.24
CD value at 1%		1.62	1.28	1.72	1.66

Statistical analysis of the data showed significant differences ($P<0.01$) in respiration rate at 4 hour period in different category of animals. Critical difference analysis of the data showed that respiration rate at 4 hours was significant lower in non-pregnant non lactating Murrah buffalo and 2-3 year heifer in comparison to other groups of animal.

Analysis variance of the data revealed significant difference ($P<0.01$) in the respiration rate at 16 hr period between difference ($P<0.01$) in the respiration rate at 16 hr period between different physiological states of animals. Critical different analysis marked out the respiration rate at 16 hr period was found significantly higher in calves less than 1 year of age and in advance pregnancy in comparison to other physiological groups of the animals.

Analysis variance of the data showed significant defiance ($P<0.01$) in pulse rate between different physiological states of the animals.

Analysis of variance of the data marked out significant difference ($P<0.01$) in pulse rate/ minute at 16 hr among different physiological states of Murrah buffalo. Significantly higher pulse rate at 16 hr period was found to be in pregnant non lactating animals followed by buffalo under 1 year age than other physiological groups of animals.

The statistical analysis indicated highly significant (p) difference between less than one year of age and other age groups. Taneja and Bhatnagar [7] (1960) reported that the average pulse rate per minute of Murrah buffalo calves was 52 and 57 in shed and open respectively. In the present studies the values were significantly lower (42.00 to 44.90 per minute) in various groups of animals.

The pulse rate at 4 and 16 hr did not vary in different physiological states of buffaloes. Similar observation by Manson [8], However, Pandey and Roy [9] showed a significant correlation (r=0.35) between pulse rate and ambient temperature in adult buffaloes and cows. Joshi [10] reported that pulse rate increased moderately during exposure to hot atmosphere from the reference cool environment.

The respiration rate was significantly higher (p)in young calves than in older ones indicating a progressive decline in respiration rate of animals with an advance in age. The present findings are in agreement with the observations of Badreldin [11] who reported higher respiration in young calves and lower in older buffaloes.

Respiration and pulse rate increased during the day and began to fall during night hours. Respiration rate was greatly affected while pulse rate continued to rise after air temperature began to fall. Actually the increase in the body temperature kept on increasing for three hours followed by a declining trend. Similar cardio-respiratory responses were reported by Badreldin [11] and Minett and Sen [12].

Conclusion

Significantly higher respiration and pulse rate were observed in calves under one year of age. The morning values of physiological reactions were lower than the evening values in all the categories of animals. Cardio-respiratory response in pregnant and lactating animals were significantly higher (p) than in non-pregnant and non-lactating animals. Highly significant difference (p) in dry matter consumption was observed by the experimental buffaloes among the different physiological states of the animals. DM digestibility was significantly higher in young calf and lactating animals. Appropriate nutrition and management system is important for high productivity to enhance to tolerance against heat, disease and parasitic infestation.

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