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Effect of housing systems and levels of feeding on dry matter intake and crude protein intake in Murrah buffalo calves in hot-humid weather

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Abstract
A study 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. There was no significant difference in dry matter intake between two housing systems. Daily dry matter intake was significantly (P<0.05) higher in ICAR 120% feeding level than ICAR 100% feeding level. And there was no significant different in Crude protein intake between two housing systems. However, Crude protein intake was significantly (P<0.05) influenced by feeding level being higher in ICAR 120% level than ICAR 100% level. It may be concluded that the dry matter intake and crude protein intake significantly influenced by feeding level.

Keywords: Murrah buffalo calves, dry matter intake, crude protein intake, loose housing system

Introduction
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. Terramoccia et al. (2000) [7] reported better degradation of both crude protein (CP) and protein free dry matter (DM) in buffaloes than in cattle. Other workers have also demonstrated a better digestive ability of buffaloes than cattle to utilize poor quality roughage (Agarwal et al., 2009) [1]. But besides this higher production is very important for farmer. Small productive life affect the condition of the farmer and ultimately the economy. One of the reasons for a smaller productive life in buffaloes is its delayed age at first calving which is generally due to improper management of calves (Singh et al., 2012) [5]. Calf mortality was associated with the type of housing, feeding, management practices, weather conditions, external and internal parasitic infestation and bacterial infections especially those causing septicaemia and enteritis (Blood et al., 1994) [3]. 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) [4] and the effect of heat stress is aggravated when heat stress is accompanied with high humidity (Marai et al., 2008) [4]. So, the present work was under taken to study the effect of housing systems and levels of feeding on dry matter intake and crude protein intake in murrah buffalo calves in hot-humid weather.

Materials & Methods
The experiment was conducted from 15th July 2015 to 15th 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_2 and T_4 got 20 per cent higher and calves of T_1 and T_3 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) [2] 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 ingreedients 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.

Feed Intake

Amount of feed and water intake was measured in 3 consecutive days in a fortnight. In every fortnight to determine feed intake the buffalo calves were given weighted quantity of feed and fodder as per their requirements. The feed intake during the experimental period was determined on the basis of feed and fodder offered and left over for three consecutive days in a fortnight.

Digestion Trial

A digestion trial of 5 days collection period was conducted at the end of the experiment to know the effect of treatment on digestibility of feed and fodder. During the collection period of the trial, all the dung voided by the individual calf was collected manually in separate labelled plastic buckets provided with lids. The dried dung of individual calf was pooled for 5 days, milled and stored in plastic bag for proximate analysis except for crude protein, which was analyzed by wet dung sample preserved in 40 per cent sulphuric acid in plastic bottles. Representative sample of concentrate mixture, Jowar, Wheat straw and left over feed were also taken daily during the trial and dried in hot air oven for determining dry matter content. The five days dried samples for feed and fodder were pooled, milled and stored for proximate analysis. The feed, fodder and dung samples were analyzed for proximate analysis according to AOAC (2005) [2].

Statistical Analysis: The experiment data was planned and analyzed as per Snedecor and Cochran, 1999 [6].

Results and Discussion

Dry matter intake

The average daily dry matter intake, Dry matter intake per 100 kg body weight and dry matter intake per kg metabolic body size under different treatments and two housing systems and two level of feeding have been presented in Table 3. and Table 4. The average daily dry matter intake and dry matter intake per 100 kg body weight were 4.710±0.011, 5.075±0.010, 4.797±0.004 and 5.031±0.004 and 3.370±0.236, 3.660±0.215, 3.603±0.180 and 3.691±0.211 kg in treatments T_1, T_2, T_3 and T_4 Respectively. The corresponding values per kg metabolic body size ($W^{0.75}$) were 115.340±5.999, 125.086±5.530, 122. 014±4.541 and 125.683±5.339 gm in T_1, T_2, T_3 and T_4 Respectively. The average daily dry matter intake and dry matter intake per 100 kg body weight were 4.912±0.008, 4.914±0.003, 4.753±0.006 and 5.053±0.005, and 3.515±0.210, 3.647±0.179, 3.486±0.161 and 3.676±0.182 kg in loose house, Conventional barn, ICAR 100% and ICAR 120% respectively. The corresponding values per kg metabolic body size ($W^{0.75}$) were 120.213±5.331, 123.848±4.523, 118.677±4.029 and 125.384±4.640 gm in loose house, Conventional barn, ICAR 100% and ICAR 120% respectively.

The analysis of variance revealed that in the experiment there was no significant difference in dry matter intake between two housing systems. However, dry matter intake was significantly influenced by feeding level. The daily dry matter intake/100kg body weight and dry matter intake per kg metabolic body size was non-significant. Daily dry matter intake was significantly (P<0.05) higher in ICAR 120% level than ICAR 100% level. Higher amount of feed given directly leads to higher dry matter intake by the animals grouped in ICAR 120% feeding level group. Dry matter intake also influenced by genetic makeup and also due to comfortable environment. Dry matter intake slightly higher in loose house as compared to conventional barn type housing system may be due to comfortable environment.

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 (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 daily dry matter intake of buffalo calves under different treatments

Treatments	Daily DMI (kg)	DMI/100kg b.wt (kg)	DMI/kg $W^{0.75}$ (gm)
T_1	4.710±0.011	3.370±0.236	115.340±5.999
T_2	5.075±0.010	3.660±0.215	125.086±5.530
T_3	4.797±0.004	3.603±0.180	122.014±4.541
T_4	5.031±0.004	3.691±0.211	125.683±5.339

Table 4: Effect of Housing System and level of feeding on average daily Dry matter intake by buffalo calves

Variables	Housing system		Feeding level	
	Loose house	Conventional barn	ICAR 100%	ICAR 120%
Daily DMI (kg)	4.912^{c}±0.008	4.914^{c}±0.003	4.753^{a}±0.006	5.053^{b}±0.005
DMI/100 kg b. wt (kg)	3.515±0.210	3.647±0.179	3.486±0.161	3.676±0.182
Dmi/kg $W^{0.75}$(gm)	120.213±5.331	123.848±4.523	118.677±4.029	125.384±4.640

Means in Rows with different superscripts differ significantly (P<0.05)

Table 5: Average daily Crude protein intake (gm) of buffalo calves under different treatments

Variables	Housing system		Feeding level	
	Loose house	Conventional barn	ICAR 100%	ICAR 120%
Daily Crude protein intake	552.387^{c}±0.001	552.385^{c}±0.001	530.213^{a}±0.001	574.566^{b}±0.001
Crude protein intake/100kg body weight	397.557±23.904	412.659±20.737	392.364±18.761	417.852±20.496
Crude protein intake/kg $W^{0.75}$	13.590±0.609	14.010±0.525	13.346±0.471	14.254±0.522

Means in Rows with different superscripts differ significantly (P<0.05)

Table 6: Effect of Housing System and level of feeding on average daily Crude protein intake (kg) by buffalo calves

Treatments	Daily CP intake	CP intake/100kg b.wt	CP intake/kg $W^{0.75}$
T_1	530.216±0.004	380.482±27.159	13.012±0.694
T_2	574.565±0.001	414.631±23.939	14.168±0.613
T_3	530.220±0.004	404.246±20.652	13.680±0.522
T_4	574.565±0.001	421.072±24.305	14.340±0.617

Crude protein intake

The average daily Crude protein intake, Crude protein intake per 100 kg body weight and Crude protein intake per kg metabolic body size under different treatments and two housing systems and two level of feeding have been presented in Table 5. and Table 6. The average daily Crude protein intake and Crude protein intake per 100 kg body weight were 530.216±0.004, 574.565±0.001, 530.220±0.004 and 574.565±0.001, and 380.482±27.159, 414.631±23.939, 404.246±20.652 and 421.072±24.305 gm in treatments T_1, T_2, T_3 and T_4 Respectively. The corresponding values per kg metabolic body size ($W^{0.75}$) were 13.012±0.694, 14.168±0.613, 13.680±0.522 and 14.340±0.617 gm in T_1, T_2, T_3 and T_4 Respectively. The average daily Crude protein intake and Crude protein intake per 100 kg body weight were 552.387±0.001, 552.385±0.001, 530.213±0.001 and 574.566±0.001, and 397.557±23.904, 412.659±20.737, 392.364±18.761 and 417.852±20.496 gm in loose house, Conventional barn, ICAR 100% and ICAR 120% respectively. The corresponding values per kg metabolic body size ($W^{0.75}$) were 13.590±0.609, 14.010±0.525, 13.346±0.471 and 14.254±0.522 gm in loose house, Conventional barn, ICAR 100% and ICAR 120% respectively. There was no significant different in Crude protein intake between two housing systems. However, Crude protein intake was significantly (P<0.05) influenced by feeding level. Daily Crude protein intake was significantly higher in ICAR 120% level than ICAR 100% level. Reason may same as dry matter intake.

So, it may be concluded that the dry matter intake and crude protein intake significantly influenced by feeding level being higher in ICAR 120% level than ICAR 100% level.

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