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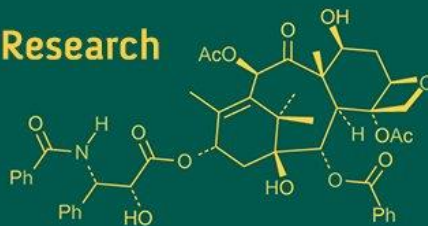
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Biometric evaluation of surti buffalo (*Bubalus bubalis*) calves under modified feeding systems

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Abstract
The present investigation entitled "Biometric Evaluation of Surti Buffalo Calves Under Modified Feeding Systems" was carried out from January, 2022 to April, 2022 on Surti Buffalo calves maintained at Livestock Research Station, Navsari Agricultural University, Navsari, Gujarat. For this experiment 16 Surti Buffalo calves aged more than three months were selected. Experimental animals were divided into 2 groups of 8 calves each of comparable age, sex and body weight. T_1 group was offered conventional feed and T_2 group was offered complete feed block. While dietary treatments differed, all animals remained under uniform management conditions. Growth performance was monitored through fortnightly body weight measurements throughout the study period.
Overall body length (87.32±1.38 vs. 86.06±1.23cm), height at wither (92.78±1.05 vs. 90.05±0.92cm), thoracic girth (108.67±1.68 vs. 104.71±4.34cm), abdominal girth (122.12±2.26 vs. 119.16±1.84cm) and body weight (86.11±3.00 vs. 82.43±2.65kg) was higher in T_1 as compared to T_2 group though it was not significant.

Keywords: Complete feed block, body length, height at wither, thoracic girth, abdominal girth, body weight

1. Introduction

Farmers of Asian continent use tamed water buffaloes for agriculture and other socio-economic purpose and popularly known as "The living tractor of the East." (Bakkannavar *et al.* 2010) [1]. Buffaloes are known as Asia's "Black Gold" and have become the choice of milch animal for farmers (Presicce, 2007) [4] due to its attractive colour and economic value to the society.

The Surti buffalo (*Bubalus bubalis*) is one of India's most well-known buffalo breeds. The Surti buffalo breed is bred in Gujarat's Kaira and Baroda districts. The body is well-shaped and medium in size, with a wedge-shaped barrel. The head of this breed is quite large with straight back conformation. This breed has medium-sized animals with sickle-shaped horns and prominent eyes. It's either black or brown in colour. The breed is specifically distinguished by two white marking, one around the jaw and the other around the brisket. Milk output varies between 900 and 1300 kg with high fat content (8-10 %). The age at first calving is 40-50 months, with inter-calving time of 400-500 day. Birth weight of calves varies from 21 to 25 kg (Thamilvanan *et al.* 2009) [7].

Animal owners frequently did not chaff and soak the straw or stover, and feed it to their animals in un-chopped or semi-chopped forms. Furthermore, un-chopped straw allows the animal to selectively choose digestible portion, while leaving less digestible, rough parts behind, resulting in increased wastage; moreover, the animal must expend more energy chewing un-chopped materials, resulting in increased energy expenditure (Chander, 2010) [2] and ultimately reduce the production performance in animals.

The terms such as "Complete Feed" and "Total Mixed Ration" (TMR) or "Complete Ration" (CR) are inter-changeable. As the name suggests, a complete feed block is an animal edible product created by compacting complete feed consisting of roughage and concentrate into a predetermined proportion capable of meeting the nutrient requirements for the targeted animal production system. The CCFB (Compressed Complete Feed Block) is a ready-to-eat complete diet that is convenient, affordable and multi-nutrient correct (Salem and Nefzaoui, 2003) [5] ration for ruminants.

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Which results in a more stable and optimal environment for rumen microbial fermentation, which ultimately improve dry matter intake (DMI) and production performance (Verma *et al.* 1996) [8].

2. Materials and Methods

The research study entitled "Biometric Evaluation of Surti Buffalo Calves Under Modified Feeding Systems" was carried out in Surti Buffalo breed from January to April 2022, for a period of 90 days. The study was conducted at the Livestock Research Station, Navsari Agricultural University, Navsari. This unit is located at 20.95˚N 72.93˚E and at an elevation of 11.89 m above Mean Sea Level (MSL). The climate of the area is tropical with average maximum and minimum temperatures of 40 °C (104˚F) and 17 °C (62.6˚F) respectively. The experiment was undertaken to study the effect of complete feed block on growth performance of Surti buffalo calves under farm condition. The calves were divided into two groups, control (T_1) and treatment (T_2) comprising of eight buffalo calves in each group on the basis of age, sex and body weight. In T_1 group conventional feed and in T_2 group complete feed block was offered to the animals.
Ingredients of complete feed block.

Table 1: Ingredients of complete feed block

Ingredients	Proportion %
Millet bran	50
Molasses	10
Tech. Graded Urea	1
Calcite powder	2
Grinded salt	2
Wheat straw	25
Concentrate	10
Total	100

The calves were housed individually in well ventilated, clean and dry pucca shed with facilities for feeding and watering. The shed was disinfected with potassium permanganate solution, sanitized and white washed prior to the introduction of calves.
Each buffalo calves were tied with rope near the manger to ensure that it received feed individually.
Each animal was given different identification number. The control group (T_1) was kept on conventional feeding as per farm routine, while treatment group (T_2) was fed compressed complete feed block (CCFB).Both the diets were made iso-nitrogenous and iso-caloric to meet the requirement for growth as per ICAR standards (2013). The calves were de-wormed and vaccinated before the start of the experiment and group housed on cemented concrete floor with provision of feeding and watering. All the calves were fed conventionally as per the requirement of adaptation period of 7 days.

2.1 Body length
The body length of experimental animals was recorded with the help of measuring tape by taking measurement on either side of animal from the point of shoulder to the point of pin bone and the average was recorded in cm.

2.2 Height at withers
The animals were made to stand on a levelled floor with its head in normal position and then the height was recorded as the distance from the ground to the highest point of withers on either side of the body and was recorded in cm.

2.3 Thoracic girth
The circumference of the body over the chest of the animal immediately behind the shoulder, forelegs and the hump, recorded in cm.

2.4 Abdominal girth
The circumference around the abdomen ahead of the udder, recorded in cm.

2.5 Weight of animals
The body weight of the experimental animals was recorded in the morning prior to feeding and watering at the beginning and then at fortnightly intervals during the entire length of experiment with the help of electrically operated digital platform in kilogram.

2.7 Statistical Analysis
Data collected during course of experiment was first tabulated using descriptive statistics and analyzed by t-test and mean within the group was compared using Duncan Multiple Range Test (DMRT) with the help of SPSS software.

3. Results and Discussions
3.1 Body length in calves (cm)

Table 2: Mean ± S E of body length in calves (cm)

Day of observations	T_1 (N = 8)	T_2 (N = 8)	t-value	P-Value
Initial	74.64^d±2.26	74.29^f±1.87	0.119	0.907
15th day	79.72^{de}±2.24	78.20^{ef}±1.86	0.523	0.609
30th day	84.36^{cd}±2.01	82.89^{de}±1.84	0.535	0.601
45th day	87.72^{bc}±2.14	86.66^{cd}±1.71	0.336	0.742
60th day	91.34^{abc}±2.75	89.66^{bc}±1.97	0.496	0.628
75th day	94.83^{ab}±2.65	93.18^{ab}±1.89	0.507	0.620
90th day	98.64^a±3.22	97.41^a±2.42	0.307	0.764
Overall	87.32±1.38	86.06±1.23	0.679	0.498
F-value	11.388**	17.623**	-	-

* & ** indicates significance at *p*<0.05 and *p*<0.01, respectively across rows and columns means bearing different superscript within column differ significantly (*p*<0.05).

The mean value of body length on Initial, 15th, 30th, 45th, 60th, 75th and 90th day of study as well as overall body length for T_1 group was 74.64±2.26, 79.72±2.24, 84.36±2.01, 87.72±2.14, 91.34±2.75, 94.83±2.65, 98.64±3.22 and 87.32±1.38, T_2 group was 74.29±1.87, 78.20±1.86, 82.89±1.84, 86.66±1.71, 89.66±1.97, 93.18±1.89, 97.41±2.42 and 86.06±1.23 respectively.
Overall mean of body length of calves was higher in T_1 group as compare to T_2 group through it was not significantly different. Length of calves was higher in T_1 group as compared to T_2 group on different test days. The Mean value of T_1 group and T_2 group showed increasing trend from Initial to 90th day in both the groups. The F-value of both the groups was higher significantly (*p*<0.01).

3.2 Height at wither in calves (cm)

Table 3: Mean ± S E of height at wither in calves (cm)

Day of observations	T_1 (N = 8)	T_2 (N = 8)	t-value	P-Value
Initial	84.83^d±2.68	81.75^c±1.65	0.977	0.345
15th day	88.32^{cd}±2.83	87.15^{bc}±1.57	0.362	0.723
30th day	91.53^{bcd}±1.94	90.26^{ab}±1.70	0.491	0.631
45th day	93.24^{abc}±2.05	91.88^{ab}±1.95	0.482	0.637
60th day	95.72^{ab}±2.01	92.39^{ab}±1.17	1.427	0.175
75th day	100.45^a±2.31	93.20^a±1.45	1.555	0.142
90th day	103.37^a±2.34	96.74^a±3.74	1.049	0.312
Overall	92.78±1.05	90.05±0.92	1.947	0.054
F-value	4.858**	4.924**	-	-

* & ** indicates significance at $p<0.05$ and $p<0.01$, respectively across rows and columns means bearing different superscript within column differ significantly ($p<0.05$).

The mean value of height at wither on initial, 15th, 30th, 45th, 60th, 75th and 90th day of study as well as overall height at wither for T_1 group was 84.83±2.68, 88.32±2.83, 91.53±1.94, 93.24±2.05, 95.72±2.01, 100.45±2.31, 103.37±2.34 and 92.78±1.05 for T_2 group was 81.75±1.65, 87.15±1.57, 90.26±1.70, 91.88±1.95, 92.39±1.17, 93.20±1.45, 96.74±3.74 and 90.05±0.92 respectively.
The overall height of calves was higher in T_1 than T_2 group. Height at wither of calves in T_1 group was higher than T_2 group on different test days observation. While comparing within group the height at wither was similar on 30th, 45th and 60th day in T_1 group and it was similar on 30th, 45th, 60th and 75th day in calves of T_2 group.

3.3 Thoracic girth in calves (cm)

Table 4: Mean ± S E of thoracic girth in calves (cm)

Day of observations	T_1 (N = 8)	T_2 (N = 8)	t-value	P-Value
Initial	98.45^c±4.52	90.32^c±3.93	1.356	0.197
15th day	103.34^{bc}±4.66	99.25^b±2.51	0.772	0.453
30th day	107.95^{abc}±3.84	102.80^b±2.57	1.111	0.285
45th day	107.37^{abc}±3.61	105.95^{ab}±2.20	0.337	0.741
60th day	109.79^{abc}±3.17	106.61^{ab}±2.14	0.829	0.421
75th day	117.98^a±4.35	114.48^a±3.49	0.696	0.498
90th day	115.82^{ab}±4.28	113.57^a±3.18	0.422	0.679
Overall	108.67±1.68	104.71±4.34	1.784	0.077
F-value	2.719*	9.030**	-	-

* & ** indicates significance at $p<0.05$ and $p<0.01$, respectively across rows and columns means bearing different superscript within column differ significantly ($p<0.05$).

The mean value of thoracic girth on initial, 15th, 30th, 45th, 60th, 75th and 90th day of study as well as overall thoracic girth for T_1 group was 98.45±4.52, 103.34±4.66, 107.95±3.84, 107.37±3.61, 109.79±3.17, 117.98±4.35, 115.82±4.28 and 108.67±1.68 for T_2 group was 90.32±3.93, 99.25±2.51, 102.80±2.57, 105.95±2.20, 106.61±2.14, 114.48±3.49, 113.57±3.18 and 104.71±4.34 respectively.
The overall thoracic girth of T_1 group of calves was higher than T_2 group. The F-value of both the groups were higher significantly ($p<0.01$). Thoracic girth of T_1 and T_2 groups showed increasing trend from initial to 90th day. Almost similar thoracic girth was found in T_1 and T_2 groups on 45th, 60th, 75th and 90th day.

3.4 Abdominal girth in calves (cm)

Table 5: Mean ± S E of abdominal girth in calves (cm)

Day of observations	T_1 (N = 8)	T_2 (N = 8)	t-value	P-Value
Initial	112.01±4.34	102.01^e±3.35	1.702	0.111
15th day	117.12±4.18	109.12^{de}±3.04	1.545	0.145
30th day	122.23±4.16	114.36^{cd}±2.60	1.602	0.132
45th day	122.01±4.85	119.25^c±2.88	0.489	0.632
60th day	125.31±3.70	121.82^{bc}±2.50	0.781	0.448
75th day	130.41±3.50	128.62^b±2.09	0.684	0.505
90th day	133.78±12.11	138.30^a±4.30	-1.052	0.311
Overall	122.129±2.26	119.167±1.84	1.013	0.313
F-value	1.076	15.442**	-	-

* & ** indicates significance at $p<0.05$ and $p<0.01$, respectively across rows and columns means bearing different superscript within column differ significantly ($p<0.05$).

The result of abdominal girth of calves have been presented in table 5. The mean value of abdominal girth on initial, 15th, 30th, 45th, 60th, 75th and 90th day of study as well as overall abdominal girth for T_1 group was 112.01±4.34, 117.12±4.18, 122.23±4.16, 122.01±4.85, 125.31±3.70, 130.41±3.50, 133.78±12.11 and 122.129±2.26 and for T_2 group was 102.01±3.35, 109.12±3.04, 114.36±2.60, 119.25±288, 121.82±2.50, 128.62±2.09, 138.30±4.30 and 119.167±1.84 respectively.
The overall mean of abdominal girth of T_1 was higher than T_2 group. Abdominal girth was higher in T_1 as compared to T_2 group of calves on all test day except 90th day. The F-values of T_2 group was highly ($p<0.01$) significant. In both the groups observation showed increasing trend from Initial to 90th day.
Ferdous *et al.* (2010) [3] while working with buffalo and crossbred calves, to study effect of urea molasses block (UMB) supplementation on heart girth length, wither height and body length of buffalo calves, reported that average heart girth, withers height and body length varied significantly ($p<0.01$). Significant difference between groups might be due to different climate, breed and time period of study.

3.5 Body weight in calves (Kg)

Table 6: Mean ± S E of body weight in calves (Kg)

Day of observations	T_1 (N = 8)	T_2 (N = 8)	t-value	P-Value
Initial	66.13^b±5.83	63.11^d±5.20	0.384	0.707
15th Day	78.63^{ab}±6.41	73.25^{cd}±5.76	0.624	0.543
30th Day	82.13^{ab}±7.08	77.13^{bcd}±5.45	0.560	0.585
45th Day	84.13^{ab}±5.94	83.19^{abc}±6.03	0.111	0.913
60th Day	91.38^a±7.11	86.88^{abc}±6.09	0.481	0.638
75th Day	100.19^a±7.97	94.81^{ab}±6.22	0.532	0.603
90th day	100.19^a±9.65	98.69^a±7.40	0.123	0.904
Overall	86.11±3.00	82.43±2.65	0.915	0.362
F-Value	2.852**	4.195**	-	-

* & ** indicates significance at $p<0.05$ and $p<0.01$, respectively across rows and columns means bearing different superscript within column differ significantly ($p<0.05$).

The Mean value of Body weights (Kgs) at initial, 15th, 30th, 45th, 60th, 75th and 90th day of study as well as overall body weight for T_1 group was 66.13±5.83, 78.63±6.41, 82.13±7.08, 84.13±5.94, 91.38±7.11, 100.19±7.97, 100.19±9.65 and 86.11±3.00 and for T_2 group was 63.113±5.20, 73.25±5.76, 77.13±5.45, 83.19±6.03,

86.88±6.09, 94.81±6.22, 98.69±7.40 and 82.43±2.65, respectively.

The overall mean of body weight of T_1 group were higher than T_2 group though the difference was not significant. Comparison between groups revealed no significant difference for body weights throughout the study period. Within T_1 group body weights at 60th, 75th and 90th day were significantly ($p<0.05$) higher than Initial whereas within T_2 group body weights were significantly ($p<0.05$) higher at 45th and 60th days than initial, at 75th day than Initial and 15th and 90th day. The F-values were significant in both the groups.

Contrast to our result, Singh *et al.* (1998) [6] carried out a study on evaluation of berseem based complete feed blocks in 12 growing buffalo calves categorized into 2 groups. They noticed significantly ($p<0.05$) higher live weight gain in growing buffalo calves fed on complete feed blocks. This might be due to difference in weather and duration of experiment.

Conclusions
Overall body weight of T_1 was higher than T_2 group of calves though the difference was not significant. Overall body length, height at wither, thoracic girth and paunch girth of T_1 was higher than T_2 group of calves though the difference was not significant.

Acknowledgment

References
1. Bakkannavar SM, Monteiro FNP, Bhagavath P, Kumar GP. Death by attack from a domestic buffalo. Journal of Forensic and Legal Medicine. 2010;17:102-104. https://doi.org/10.1016/j.jflm.2009.09.008
2. Chander M. Chaff cutters and fodder chaffing: a simple technology worth adoption. Successes and Failures with Animal Nutrition Practices and Technologies in Developing Countries. 2010;133. https://doi.org/10.3168/jds.S0022-0302(86)80541-0
3. Ferdous S, Masum AKM, Khan MAS, Islam MA. Comparative study of the performance of buffalo calves and cow calves by feeding urea molasses block with straw based diet. Journal of the Bangladesh Agricultural University. 2010;8(1):87-90.
4. Presicce GA. Reproduction in water buffalo. Reproduction in Domestic Animals. 2007;42:24-32. https://doi.org/10.1111/j.1439-0531.2007.00907.x
5. Salem HB, Nefzaoui A. Feed blocks as alternative supplements for sheep and goats. Small Ruminant Research. 2003;49(3):275-288. https://doi.org/10.1016/S0921-4488(03)00144-5
6. Singh RJ, Singh B, Bakshi MPS, Tiwana MS. Effect of complete diet feeding system on the productive performance of buffalo calves. Buffalo Journal. 1998;3:285-290.
7. Thamilvanan T, Ramesh V, Muralidharan MR, Shivakumar T. Certain factors influencing the birth weight and mortality of Surti and Surti graded buffalo calves. Cheiron. 2009;32(1-2):27-29.
8. Verma AK, Mehra UR, Dass RS, Singh A. Nutrient utilization by Murrah buffaloes (*Bubalus bubalis*) from compressed complete feed blocks. Animal Feed Science and Technology. 1996;59(4):255-263. https://doi.org/10.1016/0377-8401(95)00911-6