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Short Communication

EFFECT OF VARYING LEVELS OF DIETARY CATION-ANION DIFFERENCE (DCAD) ON BODY CONDITION SCORE OF TRANSITION BUFFALOES

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SUMMARY

The influence of varying dietary cation-anion difference (DCAD) on body condition score (BCS) was studied on 20 transition Murrah buffaloes. Before calving (30 days pre-partum) BCS with two negative DCAD level i.e., -50 mEq (low negative; LN) and -100 mEq (high negative; HN) per kg of dry matter were compared and after calving, two positive DCAD levels i.e.+200 mEq (low positive; LP) and +400 mEq (high positive; HP) per kg of dry matter were compared in sucha way that 4 groups were formed in postpartum period *viz*. LN-LP & LN-HP and HN-LP & HN-HP. In prepartum period, BCS with 2 negative DCAD levels were 4.03 and 4.02 for LN and HN DCAD levels, respectively, which were comparable and optimum for buffaloes near calving. In postpartum period, BCS achieved with 4 different DCAD combinations were 4.10, 3.95, 3.87 and 3.87 for LN-LP, LN-HP, HN-LP and HN-HP groups, respectively. The BCS of later 2 groups is better in relation to better production and reproduction performance traits in buffaloes. Thus, we can say HN DCAD during prepartum and LP DCAD during postpartum are helpful in achieving better BCS in buffaloes.

Keywords: Body condition score, Buffalo, DCAD, Transition period

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Body condition score (BSC) is a subjective scoring method which provides better understanding of biological relationship between various components like body fat reserves, productive and reproductive capabilities like early resumption of oestrus. It is simple and efficient method to evaluate the body tissue and energy reserves of lactating dairy animals independent of frame size and body weight. In Murrah buffaloes longer inter calving period and age at first calving, which may be occur due to several genetic and non–genetic factors like parity, period of calving, ration given during calving and season of calving can be avoided to improve the productive period in buffaloes (Jakhar *et al.*, 2016). Changing the DCAD of diet (non-genetic factor) to improve animals BCS, which further may have direct and indirect effect on reproduction and production of the animal is one such approach. For BCS, the evaluation of the external appearance of the animal is judged through a 5-point scale with one point equivalent to emaciated animal and 5 points indicating obesity. It is the actual measure of body fat reserves of the animal (Anitha *et al.*, 2011). Dietary Cation-Anion Difference (DCAD) helps to measures the levels of four macro-minerals, two cation and two anions in the diet, represented by the formula ([Na+] + [K+]) – ([Cl-] + [S]) = mEq/ kg of DM. It has profound effect on lactation performance, acid-base homeostasis, Ca status around calving, mineral element utilization and health of dairy animal. The studies on BSC of buffaloes are available but very less scientific information on influence of varying levels of dietary cation-anion difference (DCAD)on BCS during transition period is available. Therefore, the present project was planned to examine the effect of varying pre-partum and post-partum DCAD levels on BCS of Murrah buffaloes.

The current study was conducted at in the Department of Animal Nutrition and Dairy farm (DLF), Guru Angad Dev Veterinary and Animal Sciences University (GADVASU), Ludhiana. The research work on effect of feeding varying levels of dietary cation-anion difference (DCAD) on performance of transition buffaloes (GADVASU/2020/IAEC/56/03) was approved in Proceedings of 55th meeting of IAEC held on 31.10.2020. For the experiment, 20Murrah buffaloes, 30 days prepartum were selected and divided into 2 groups *viz*. LN and HN, each of 10 animals following completely randomized block design (CRD) based on average body weight (630 vs 670 kg), most probable lactational yield (1211.4 vs 1217.5 kg) and parity (1st, 2nd or 3rd). For estimation of cations and anions in the feed and fodder, the samples were sent to Punjab Biotechnology Incubator (PBTI), Mohali. The levels of potassium and sodium% in samples were analysed according to standard method of AOAC 968.08 by ICP-MS (Mcguire and Hite,1998). The basal diet of prepartum animals was composed of wheat straw, concentrate and silage and fed according to ICAR (2013) feeding standard. The ration was balanced up to -50 (LN) and -100 (HN) mEq/kg dry matter using ammonium chloride. Same animals after calving were selected and

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Fig 1. **(a)** Buffalo with BCS of 3.5; **(b)** Buffalo with BCS of 4; **(c)** Buffalo with BCS of 4.25; **(d)** Buffalo with BCS of 4.5

divided into further 4 groups, each of 5 animals according to previous grouping parameters within each group. Five out of ten animals which were fed HN DCAD diet pre-partum were fed +200 (LP) DCAD diet making HN-LP group and other five were fed +400 (HP) DCAD diet making HN-HP group. Similar grouping was done for 10 animals which were fed LN DCAD diet in pre-partum stage making LN-LP and LN-HP group. Postpartum lactating buffaloes were fed total mixed ration (TMR) with roughage to concentrate ratio of 60:40 which was balanced up to +200 (LP) and +400 (HP) mEq/kg dry matter using disodium hydrogen orthophosphate. Equation used for formulating negative and positive DCAD diet was: ([Na+] + [K+]) – ([Cl-] + [S]) = mEq/kg of DM or (% Na/0.023 + %K/0.039) - (%Cl/0.0355 + %S/0.016) mEq/kg of DM. The DCAD levels of the diets and quantity of salts added to reach desired levels of DCAD is given in Table 1. Based on study conducted by Anitha *et al.* (2011), 8 skeletal check points of Murrah buffaloes in transition period were examined for scoring the animal. These skeletal check points were,

1. Tail head to pin bones
2. Spinous process of lumbar vertebrae
3. Transverse process of lumbar vertebrae
4. Depression between spinous and transverse process
5. Point between 12th and 13th ribs
6. Sacral crest
7. Depression between sacral crest and hooks
8. Depression between hooks and pins

Body condition score was evaluated after every 15 days i.e., -25 days and -10 days before calving and +10 days and +25 days after calving. Data was analysed using SPSS, 2016 software using ANOVA with interaction, as described by Snedecor and Cochran (1994), by using SPSS (2012) version 21.

The results of effect of negative DCAD on BCS are given in Table 2. It was observed that there was no

Table 1. DCAD level of prepartum and postpartum total mixed ration (TMR) with dose of cationic and anionic salt

Sr. No.	Sample relative to calving	DCAD of TMR (mEq/kg DM) *	Anionic/cationic saltrequired	Final DCAD of TMR (mEq/kg DM)
1.	Prepartum	+32.008	LN= 53 gm	-50.546
			HN= 85 gm	-100.39
2.	Postpartum	+245.47	LP= 10 gm	+257.21
			HP= 132 gm	+400.44

Table2. Average BCS with negative DCAD in prepartum period

Parameter	LN	HN
-25 days	4.00±0.11	4.00±0.23
-10 days	4.07±0.12	4.05±0.19
Average	4.037±0.12	4.025±0.21

Table 3. Post-partum average BCS with varying levels of DCAD

Parameter	LN-LP	LN-HP	HN-LP	HN-HP
BCS	4.10±0.24	3.95±0.10	3.87±0.13	3.87±0.24

Table 4. Average BCS with positive DCAD diets in postpartum irrespective of prepartum treatment

Parameter	LP	HP
+10 days	4.00±0.23	3.90±0.17
+25 days	3.97±0.21	3.92±0.20
Average	3.98±0.22	3.91±0.18

significant difference ($p>0.05$) in the BCS of the animals fed two different levels of anions in the prepartum period. The average BCS of LN and HN group was 4.03 and 4.02, respectively, which is optimum for prepartum transition Murrah buffaloes. Baruselli *et al.* (2001) and Ezenwa *et al.* (2009) investigated the correlation between BCS and time required for conception in buffalo. They observed that buffaloes with BCS 4.0 to 4.5 at calving had a shorter interval to achievement of pregnancy. Thus, results obtained after prepartum trial with two negative DCAD levels in current study showed that BCS was within range

and negative DCAD diet was helpful in achieving optimum BCS in prepartum transition Murrah buffaloes. Optimum postpartum BSC (3.8-3.9 score) was reported for LN-HP with average BCS of 3.95, HN-LP with average BCS of 3.87 and HN-HP group with average BCS of 3.87 (Table 3). Anitha *et al.* (2011) and Banu *et al.* (2012) analysed the influence of body condition score at calving (BCS) on the reproductive and productive performance in buffaloes and revealed that buffaloes of BCS group 3.5-3.99 showed the best performance with respect to resumption of ovarian activity, a shorter postpartum an oestrus period, a shorter service period, fewer services per conception, a higher rate of first service conception with higher breeding efficiency. Thus, it signifies that feeding negative DCAD during prepartum and positive DCAD during postpartum has positive influence on reproductive performance of animal. Buffaloes with different BCS as influenced by varying levels of pre- and post- partum DCAD levels are shown in figures (a-d).

The influence of two positive DCAD levels on BCS was also studied irrespective of the prepartum treatment to access its individual effect is given in table 4. Body condition score decreased with time for the both the groups. The reason for the same can be high energy requirements during early lactation period. Baruselli *et al.* (2001) reported positive correlation between BCS at calving and conception rate and minimum services per conception were recorded for buffaloes with BCS between 3 and 4.5. In our experiment, BCS of buffaloes fed LP TMR varied from 3.5-4.0 and 3.5 to 4.25 for buffaloes fed HP TMR. Thus, it provides evidence that feeding of positive cations during postpartum is helpful to improve reproductive performance in buffaloes. The present study revealed that both negative DCAD diets pre-partum and positive DCAD post-partum were helpful in achieving optimum body condition score (BCS) in transition buffaloes which have positive correlation with overall performance of the animal.

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