



Effect of Feeding Straw Based Densified Complete Feed Blocks Containing Dhanwantharam Oil Residue and Tapioca Starch Waste on Body Weight, Dry Matter Intake, Feed Conversion Efficiency and Nutrient Digestibility in Crossbred Heifer Calves

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ABSTRACT

The study was carried out to evaluate the effect of feeding straw based densified complete feed blocks (DCFB) containing dhanwantharam oil residue and tapioca starch waste (TSW) on body weight (BW), dry matter intake (DMI), feed conversion efficiency (FCR) and nutrient digestibility in crossbred heifer calves. Eighteen healthy crossbred calves were divided into three groups of six each as uniformly as possible with regard to age, sex and body weight and each animal was allotted randomly to one of the three dietary treatments: T₁ (straw based densified complete feed block (DCFB), T₂ (DCFB containing 20% dhanwantharam oil residue) and T₃ (DCFB containing 20%TSW). Feeding trial lasted for 90 days. A digestion trial of five days duration was conducted to assess nutrient digestibility. Average daily gain (ADG), DMI and FCR did not differ in crossbred calves of different groups. The apparent digestibility of nutrients also did not differ among the groups. The cost of feeding in group fed with DCFB containing dhanwanthram oil residue was significantly reduced than control group fed with conventional feed blocks. Thus, feeding of straw based DCFB containing dhanwantharam oil residue and TSW are beneficial in terms of feed cost.

Key words: Densified complete feed blocks, Dhanwantharam oil residue, Nutrient digestibility, Tapioca starch waste

INTRODUCTION

The availability of fibrous crop residue especially that of cereal crop and coarse straw increased to 44.26 million tonnes in 2011-12 (NIANP, 2013). This provides a great opportunity to the livestock farmers to use these as source of roughage to feed their livestock. The storage and transportation of crop residues are highly unprofitable because of its low bulk density which prevents the usage of these residues. Hence the straws are left in the field or burnt which may cause environmental pollution (FAO, 2012). Densification of straws into blocks with concentrates and other nutrients increased the bulk density and nutritional quality (Preston and Leng 1984). Densified complete feed block (DCFB) comprised of proper ratio of roughage and concentrates along with other supplements like vitamins and minerals and made into a block. DCFB provides an opportunity for incorporating

deficient nutrients and unconventional feed such as agro-industrial and ayurvedic pharmaceutical industry byproducts. Ayurvedic pharmaceutical industry by-product dhanwanthram oil residue and agro industrial byproduct TSW were found to be useful in improving growth in crossbred calves (Purushothaman, 2018 ;Seethal, 2018). The work on the incorporation of agro-industrial and ayurvedic pharmaceutical industry by-product in DCFB are scarce; hence, the present study was taken to assess the effect of feeding straw based DCFB containing dhanwantharam oil residue and tapioca starch waste on the performance of crossbred heifer calves.

MATERIALS AND MATHODS

Three complete rations were formulated with 13-15 % crude protein (CP) and 60 % total digestible nutrients (TDN). Straw was chopped, the concentrate mixture was prepared and 5 % corn-steep liquor

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(mixture containing water soluble extracts of corn soaked in water) was added which acted as a binder for block making. Then the chaffed straw and corn-steep liquor added, concentrate mixture were mixed thoroughly using horizontal mixer for about 5-10 minutes for uniform mixing. Finally, this mixture is fed to the block making machine (Real Tech Engineers, Coimbatore) and compressed to form DCFB at a pressure of 6000 psi for 30 sec. The prepared blocks were stored and used for feeding of experimental calves.

Eighteen healthy crossbred heifer calves of eight to twelve months of age were selected from University Livestock Farm and Fodder Research Development Scheme (ULF & FRDS), Mannuthy, Kerala, India. The calves were housed individually in well ventilated, clean and dry shed with facilities for feeding and watering. The calves were allocated into three groups of six each as uniformly as possible with regard to age, sex and body weight and each animal was allotted randomly to one of the three dietary treatments. The experimental design used was randomised block design. All the calves were dewormed before the commencement of the study. All the experimental calves were fed with straw based DCFB containing 60 % TDN and 13-15 % CP. Three experimental rations were T_1 - straw based DCFB (as control) T_2 - DCFB incorporating 20 % dhanwantharam oil residue and T_3 - DCFB incorporating 20 % TSW. Nutrients requirement of experimental animals were met by feeding as per the ICAR feeding standards (ICAR, 2013). Ad libitum clean fresh drinking water was offered to all the animals. All the animals were maintained under identical conditions of feeding and management throughout the experimental period of 90 days.

Body weight of the animals was recorded at fortnightly intervals during the trial. Weighed quantities of DCFB were offered daily to all the experimental animals in the morning at 0900 h and afternoon at 1400 h. Residue left was collected manually and weighed, twice a day for analysing the moisture content and estimating daily DMI. A digestibility trial for a period of five days was carried out at the end of feeding trial. During digestion trial quantities of daily feed offered,

residue left and feces voided were recorded. DM content of the feed offered as well as residue left was determined daily. The dung voided by each animal was collected quantitatively. The entire quantity of dung voided by each animal during the 24 h were weighed separately at 0800 h every day and representative samples (@1% of the total quantity voided) were taken after mixing thoroughly and stored in double lined polythene bags. The samples collected each day were stored in deep freezer (-20°C) for further analysis. At the end of the trial, samples of dung collected for the five consecutive days from each animal were pooled, mixed and representative samples were taken after through mixing for chemical analysis. The moisture and CP content in faecal samples was estimated. The proximate composition of feed, fodder and dung were analyzed as per the standard procedure (AOAC, 2016).

Data obtained on the various parameters during the course of the experiment were analyzed statistically as per Snedecor and Cochran (1994) by analysis of variance (ANOVA) technique, using the software of Statistical Programme for Social Sciences (SPSS) version 24.0.

RESULTS AND DISCUSSION

Summarized data on mean initial and final BW, total weight gain and ADG for the heifer calves maintained on three treatments are illustrated in Table 1. Statistical analysis of the data revealed that there was no significance variation ($P>0.05$) in the total weight gain and ADG of heifer calves fed on various treatments.

Patil *et al.* (2017) also observed no significance variation in the body weight of crossbred calves fed with complete feed block (CFB) without mahua seed cake and CFB containing 5 % mahua seed cake and the values were 177.73 and 181.32 kg, respectively. The results obtained in the present study are similar to above observations. However, Sharma *et al.* (2010) reported that total body weight gain and ADG was insignificant in the crossbred female calves fed with complete feed in mash form, conventional ration and complete feed block form. On disagreement to present results,

Table 1. Performance of heifer fed on three different complete feed blocks

Parameters	Group			P-value
	T ₁	T ₂	T ₃	
Growth performance				
Initial BW (kg)	135.33±8.49	135.63±13.05	132.47±18.28	0.984
Final body weight (kg)	196.50±9.36	201.30±18.25	191.77±23.26	0.932 ^{ns}
Total weight gain (kg)	61.17±3.14	65.67±6.78	59.30±5.25	0.687 ^{ns}
ADG (kg)	0.68±0.03	0.73±0.08	0.66±0.06	0.687 ^{ns}
Feed intake				
Total DMI (kg/animal)	425.50±23.06	436.84±44.13	419.94±54.65	0.960 ^{ns}
Average daily DMI (kg/animal)	4.65±0.25	4.72±0.46	4.56±0.58	0.971 ^{ns}
Average DMI/ 100kg BW	2.94±0.004	2.94±0.007	2.95±0.021	0.833 ^{ns}
FCE	7.03±0.47	6.73±0.41	6.97±0.38	0.872 ^{ns}

Mean values are based on six replicates with SE, non significant at P>0.05

Kulathunga *et al.* (2015) detected an escalation of the live weight gain in crossbred heifers fed with CFB. Similarly, Somasiri *et al.* (2010) also found that lactating dairy cattle fed with gliricidia leaf meal block showed greater live weight gain.

Statistically, there was no significant variations (P>0.05) in daily DMI and DMI per kg metabolic body size of heifer calves maintained on the three treatment groups. The data on DMI per 100 kg body weight of heifer calves revealed that during third fortnight T₁ and T₂ showed significantly higher (P<0.01) DMI percentage as compared to T₃. During fourth and sixth fortnight, T₁ showed significantly higher (P<0.01) DMI percentage as compared to treatment 2 and treatment 3.

Similar to the results of present study, Purushothaman (2018) also reported that the DMI was similar in the crossbred cattle maintained on TMRs containing dhanwantharam thailam residue and rape seed cake and the values obtained were 6.17 and 5.92 kg, respectively. Yadav *et al.* (1990) reported that the daily DMI percentage was highest in adult buffalo bulls fed with ground paddy straw based feed block as compared to animals fed with raw wheat straw and paddy straw based feed block. Khan *et al.* (2017) also observed that DMI percentage was significantly higher in adult male goats fed with DCFB with condensed tannins as compared to DCFB without condensed tannins. On disagreement to this, Das *et al.* (2004) and Singh *et al.* (2007) observed higher level of DMI in crossbred calves

Table 2. Digestibility coefficients of nutrients (%) in heifer calves fed different complete feed blocks

Parameter	Dietary treatments			P-value
	T ₁	T ₂	T ₃	
Dry matter	55.39±2.39	56.28±2.71	57.93±2.12	0.758 ^{ns}
Crude protein	58.03±1.10	58.37±2.40	57.97±2.18	0.988 ^{ns}
Crude fibre	50.88±2.39	52.17±2.88	56.87±1.69	0.203 ^{ns}
Ether extract	74.26±1.59	77.42±1.41	73.13±2.08	0.221 ^{ns}
Nitrogen free extract	59.98±2.76	58.20±3.01	62.20±2.52	0.603 ^{ns}
Neutral detergent fibre	31.88±3.42	42.25±3.46	38.44±3.71	0.144 ^{ns}
Acid detergent fibre	34.18±2.64	37.33±2.94	35.02±3.08	0.732 ^{ns}

Mean values are based on six replicates with SE; ns- non significant at P>0.05

fed with CFB and an increase in the DMI was also reported by Kulathunga *et al.* (2015) in crossbred cows fed with DCFB.

The digestibilities of nutrients of complete feed blocks are presented in Table 3. Statistically there was no significant variation ($P>0.05$) in the digestibility of nutrients in DCFB fed to heifer calves maintained on different treatments. Das *et al.* (2004) reported that there were no significant differences in the digestibility of DM, CP, CF, EE, NFE and ADF in complete feed mash and CFB fed crossbred calves. Chacko (2015) observed a similar DM, OM, CP, CF, NFE and NDF digestibility for complete feed in the lactating dairy cows.

On contrary to present results, Lailer *et al.* (2010) reported that DM, CF and NFE digestibility were significantly higher in wheat straw based CFB and bajra straw based CFB fed to Murrah male calves fed with conventional feed. Dwivedi and Pathak (2011) reported that digestibility of DM, OM, EE, NFE, NDF, CP and total digestible nutrient were significantly greater in block fed male buffaloes as compared to mash fed animals. The mean FCE (Table 2) of experimental heifer calves fed on three complete feed blocks T_1 , T_2 and T_3 were 7.03, 6.73 and 6.97, respectively. Statistically, no significant difference was observed in the cumulative FCE of heifer calves maintained on various treatments. In accordance with present results, Sharma *et al.* (2010) reported that there was no significant difference in the FCE in crossbred calves fed with complete feed in mash (7.47), block (7.59) or conventional feed form (7.93). Similarly, Kulathunga *et al.* (2015) found that there was no significant difference in the feed conversion efficiency in heifers fed with CFB prepared from different agricultural wastes such as coconut poonac, wheat flour and hybrid Napier grass. On contrary to this, Kumar *et al.* (2015) found that FCE increased by 16% in buffalo calves fed with fungal zoospore containing CFB. The costs of CFB per kg were ₹ 17.25, 13.89 and 16.42 for T_1 , T_2 and T_3 respectively. The lower cost of CFB observed in T_2 might be due to inclusion of ayurvedic pharmaceutical industry by-product dhanwantharm oil residue which was obtained at free of cost. In

accordance with these results, Seethal (2018) also had reported that the cost of feed will decrease with increased supplementation level of dhanvanthram oil residue in the feed of calves.

CONCLUSIONS

The cost of feeding in group fed with DCFB containing dhanwantharam oil residue was significantly reduced than control group fed with conventional feed blocks and hence can be recommended as an alternate cost-effective feed.

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