Journal of Advanced Veterinary Research

http://advetresearch.com/index.php/avr/index

Effect of Partial Replacement of De-oiled Rice Bran with Red Chilli Cap Powder in Concentrate Mixtures on Nutrient Utilization in Buffalo Bulls

Srinivas Kumar Dhulipalla*, Raja Kishore Konka, Raghava Rao Elineni

NTR College of Veterinary Science, Gannavaram, Andhra Pradesh, India

ARTICLE INFO

Original Research

Accepted:
14 January 2015

Available online:
15 January 2015

Keywords:

Concentrate mixture
DMI
Nutrient utilization
Red chilli cap powder

ABSTRACT

A metabolism trial was conducted after 45 days of feeding using twelve graded Murrah buffalo bulls (301.96 ± 6.98 kg) to study the effect of incorporation of red chili cap powder (RCP) in the concentrate mixture on intake and digestibility of nutrients. The buffalo bulls in the control group were fed a basal diet comprising of 5 kg chopped green fodder, 4 kg paddy straw and 1.5 kg concentrate mixture while those in treatment group were fed the same basal diet except that 25 per cent of protein supplied by de-oiled rice bran (DORB) in the concentrate mixture is replaced with RCP. The DMI (kg / 100 kg BW) was similar between the two groups. The average digestibility coefficients of dry matter (DM), organic matter (OM), crude protein (CP), ether extract (EE), crude fibre (CF), nitrogen free extract (NFE), neutral detergent fibre (NDF), acid detergent fibre (ADF), cellulose and hemi-cellulose decreased (P>0.05) with incorporation of RCP in the concentrate mixture of buffalo bulls as compared with the control. The % DCP and TDN contents decreased (P>0.05) with incorporation of RCP in the concentrate mixture as compared to the control. It can be concluded that RCP could replaced about 25 per cent of the protein supplied by DORB in the concentrate mixture of graded Murrah buffalo bulls for maintenance without any adverse effects.

Introduction

The increased demand of concentrate feed ingredients for human consumption and ever increasing cost has led to the utilization of non-conventional and non-competitive agro-industrial by-products in live-stock feeding. The exploration of new fed resources which do not compete with the human food chain is a continuous activity for maintaining the optimum productivity potentials (Waje *et al*., 2010). One such by-product from chilli processing industry is Red Chilli Cap (RCP) and can be obtained in powder form. India is the largest producer of chilli in the world and in India, Andhra Pradesh is the largest producer of chilli contributing about 53% of the total production. Moreover, Guntur district of Andhra Pradesh is very famous for production of red chillies and is very nearer to Gannavaram, where the present experiment was carried out. Huge quantity of red chilli caps are obtained as waste during processing of chillies, thus leading to disposal problem in this area. This made a drive to explore the possibility of using RCP as a feed ingredient in concentrate mixtures for ruminants. The chemical composition revealed that RCP was similar in-terms of nutrient quality to some concentrate feed ingredients that are traditionally being used in ration formulation. The major constraint in utilization of RCP is its

*Corresponding author: Srinivas Kumar Dhulipalla
E-mail address: kumardhulipalla@rediffmail.com

ISSN: 2090-6277/2090-6269/

poor palatability and unusual odour. Further, no established data is available regarding use of RCP in rations for ruminants. Hence, an attempt has been made to study the effect of incorporation of RCP in concentrate feed at minimum level on intake and nutrient utilization in buffalo bulls.

Materials and methods

Twelve graded Murrah buffalo bulls (301.96± 6.98 kg; 6 yrs) were randomly divided into two equal groups of six animals each (Control and treatment group). Red chilli cap powder was procured from Chilli processing industry, Rythu Mithra Group, Guntur district of Andhra Pradesh. RCP was incorporated at a level of 25 % of protein supplied by the de-oiled rice bran (DORB) in the concentrate mixture. During the trial, buffalo bulls in the control group were fed a basal diet comprising of 5 kg chopped green fodder, 4 kg paddy straw and 1.5 kg concentrate mixture to meet the nutrient requirements for maintenance (ICAR, 1998). In the treatment group, the buffalo bulls were fed the same basal diet while the protein content supplied through DORB in the concentrate mixture was replaced at 25 per cent by incorporating red chilli cap powder (RCP). The ingredient composition of concentrate mixtures prepared with and without RCP and fed to buffalo bulls during the trial period were presented in Table 1.

Table 1. Ingredient composition of concentrate mixtures prepared with and without RCP and fed to buffalo bulls during the trial period.

Ingredient	Control	Treatment
Maize	37	37
DORB	43	32
RCP	0	11
Cottonseed cake	15	15
Urea	2	2
Mineral mixture	2	2
Salt	1	1
Total	100	100

Initially the animals in both groups were adapted to respective diets for a period of 45 days as it takes little more time to get adapted for RCP because of its pungent odour and poor palatability. After the adaptation period, 6 days metabolism trial was conducted by shifting the animals to metabolism stalls 2 days prior to collection period for adaptation. Body weights were recorded for two consecutive days prior to start and after the metabolism trial and the mean was taken as the actual body weight. The amount of feed offered, faeces and urine voided were recorded and the representative samples were collected and pooled during the collection period. The samples of feed offered and faeces voided were analyzed for proximate constituents (AOAC, 2000) and fibre fractions (Van Soest *et al*., 1991).

The data was subjected to test of significance as per the procedures suggested by Snedecor and Cochran (1994) using SPSS Version 17.0.

Results

The chemical composition of green fodder, paddy straw, red chilli cap powder and concentrate mixture fed to buffalo bulls during the trial were presented in Table 2. Chemical analysis revealed that RCP is a moderate source of protein (15.1 %) and is similar to DORB (14 %) in its crude protein content and also in terms of other nutrients. Hence, this made a drive to replace a part of protein supplied by DORB with RCP to get the preliminary idea of level of inclusion of RCP in the concentrate mixture for large ruminants. Further, the chemical analysis revealed that RCP incorporated concentrate mixture contained higher OM, CP, EE, NFE, cellulose and hemi-cellulose and lower CF, TA, NDF and ADF content as compared to the control group concentrate mixture.

The DM intakes in control and treatment groups were 2.17 and 2.06, respectively. The digestibility (%) of DM, OM, CP, EE, CF, NFE, NDF, ADF, hemi-cellulose and cellulose were marginally lower ($P>0.05$) in buffalo bulls fed RCP incorporated concentrate mixture as compared to the control group.(Table 3). The % DCP (3.52 vs. 3.44) and TDN (55.22 vs. 54.42) contents were marginally lower in the treatment group as compared to the control. The DCP and TDN intakes (g / kg $W^{0.75}$) in control and treatment groups were 0.22, 3.47 and 0.21, 3.42, respectively.

Discussion

The daily dry matter intake (DMI), nutrient digestibility and plane of nutrition of both the control and treatment groups were presented in Table 3.

There is no significant difference in DMI of

Table 2. Chemical composition (on % DMB except for DM) of green fodder, paddy straw, concentrate mixture and red chilli cap powder fed to buffalo bulls.

Nutrient	Green Fodder	Paddy Straw	Red chilli cap powder (RCP)	Concentrate Mixture	Concentrate Mixture (RCP)
DM	27.1	90	94.26	89.1	88.4
OM	88.4	87.5	84.33	91.3	92.5
CP	8.4	3.4	15.10	18.7	19.0
EE	2.5	1.5	3.25	0.95	1.2
CF	28.7	32.2	31.84	11.8	10.9
NFE	48.8	50.4	34.14	59.85	60.4
TA	11.6	12.5	15.67	8.7	8.5
NDF	64.5	74.5	61.94	52.9	50.9
ADF	38.3	46.6	40.40	34.2	31.4
Hemi-cellulose	26.2	28.1	21.54	18.7	19.5
Cellulose	34.5	38.1	33.58	11.6	12.01
ADL	6.5	8.9	3.4	10.9	8.3

DCP: Digestible crude protein; TDN: Total digestible nutrients

Table 3. Effect of incorporation of red chilli cap (RCP) powder in concentrate mixture on intake, digestibility of nutrients and plane of nutrition in buffalo bulls.

Particulars	Control Group	Treatment Group	SEM
Dry matter intake ^{NS}			
Kg/100 Kg BW	2.13	2.06	0.05
g/kg $W^{0.75}$	88.16	86.02	1.56
Digestibility of nutrients (%)^{NS}			
Dry Matter	54.04	52.23	0.63
Organic Matter	62.06	60.78	0.53
Crude Protein	45.08	44.07	0.64
Ether extract	49.97	47.52	0.74
Crude Fibre	52.07	50.92	0.57
Nitrogen Free Extract	69.18	68.18	0.47
Neutral detergent Fibre	50.03	48.95	0.75
Acid detergent Fibre	49.35	48.48	0.75
Hemi-cellulose	52.85	49.92	0.82
Cellulose	59.45	57.67	0.65
Nutrient intake (g / Kg $W^{0.75}$)^{NS}			
DCP intake	0.22	0.21	0.09
TDN intake	3.47	3.42	0.99
Plane of nutrition ^{NS}			
DCP (%)	3.52	3.44	0.05
TDN (%)	55.22	54.42	0.33

Values in same row with no superscripts did not differ significantly ($P > 0.05$)

DCP: Digestible crude protein; TDN: Total digestible nutrients

both the control and treatment groups. Further, the average DMI of buffalo bulls fed both control and treatment diets were comparable to the values recommended by ICAR (1998) and Kearl (1982) standards. This indicated that both the diets were palatable and that incorporation of RCP in concentrate mixture had not affected the palatability. The digestibility co-efficients (Table 3) of DM, OM, CP, EE, CF, NFE, NDF, ADF, cellulose and hemicellulose decreased marginally in the treatment group as compared to the control group but the differences were not significant (P> 0.05). Similarly, Srinivas Kumar *et al*. (2012) reported non-significant decrease in digestibility of nutrients with incorporation of unconventional feeds (Sun dried Azolla) in the concentrate mixtures for ruminants. The marginal decrease observed in the digestibility of gross nutrients and fibre fractions observed in the present study may be attributed to the presence of anti-nutritional factors such as tannins present in RCP.

The DCP (%) content decreased (P>0.05) with incorporation of RCP in the concentrate mixture as compared to the control group (Table 3). However, the DCP intake expressed as g / kg $W^{0.75}$ was higher than the requirements suggested by ICAR (1998) and Kearl (1982) standards. The lower DCP content observed in buffalo bulls fed RCP incorporated concentrate mixture may be attributed to their marginally lower CP digestibility (%) as compared with the control. Similarly, the TDN (%) content decreased (P>0.05) with incorporation of RCP in the concentrate mixture as compared to the control (Table 3) reflecting the decreased digestibilities of nutrients in buffalo bulls fed RCP incorporated concentrate mixture. Further, the present study indicated that the TDN intake (g / kg $W^{0.75}$) was higher than the requirements suggested by ICAR (1998) and Kearl (1982) standards. Furthermore, the DCP and TDN intakes observed in the present study indicate that even though the buffalo bulls are fed different diets, they were maintained on the same plane of nutrition (Table 3). Finally, when cost economics is considered, incorporation of RCP in the concentrate mixture will save ₹ 1.81/- per animal per day as compared to those fed control.

Conclusion

It can be concluded that red chilli cap powder (RCP) could replace about 25 per cent of protein supplied through DORB in the concentrate mixture of buffalo bulls without any adverse effect. However, this is only a preliminary study incorporating RCP at very low levels in order to study the acceptability by the animals. Hence, further trials incorporating RCP at higher levels and in producing animals needs to be conducted before recommending its use in ruminant rations in order to reduce the cost of production.

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