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Nutritional evaluation of leaf meal added crop residue based feed block for growing male buffaloes

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ABSTRACT

Densified feed blocks of wheat straw (64.2%) along with *Stylosanthes hamata* meal (13.8%), *Leucaena leucocephala* leaf meal (13.8%) and Guar gum waste powder (8.2%) were prepared using densifying machine. Average size of the blocks was 30 cm×33 cm×42 cm and average density of blocks was 323.2 kg/m^3. Digestibility trial was conducted after one month feeding on two groups (n=6) of Bhadawari male buffaloes (mean weight 230 ± 19 kg). Group 1 was fed with leaf meal added feed blocks (G1) and group 2 with wheat straw and concentrate in the ratio 60:40 in mesh form as a control (G2). DMI was almost comparable (2.51 vs 2.27 kg/100kg bw) however, the DMD (%) was significantly higher G1 (59.2) compared to G2 (51.4). Digestibility coefficients for OM, CP, NFE, NDF, DCP and TDN followed the trend of DM digestibility in Bhadawari buffaloes. Addition of leaf meal with crop residue significantly improved the nutrient digestibility and nutritive value of feed blocks.

Key words: Buffaloes, Densification, Feed block, Leaf meal, Nutrient utilization, Value addition

Fibrous feed resources like crop residues are staple feed for the livestock of Indian subcontinent. These feeds are characterized by low digestibility, hence low metabolizable energy, low crude protein and low content of minerals and vitamins (Owen and Jayasuriya 1989). Further, high volume and low nutritive value crop residues do not permit their economic transportation from surplus to deficit areas and in hilly region and deserts especially during natural calamities like drought, cyclone and floods. The straw is transported from production area to the markets of deficit area mainly by overloaded trucks. However, if straw is made in block form, the feed factories should be established in production area to minimize the transport cost from factory to market.

Ruminants fed low quality forage require supplementation with the critically deficient nutrients to optimize productivity. Leaf meal is considered rich source of protein, mineral and vitamins. Leaf meal processing technology has been standardized for Stylosanthes, Leucaena and other protein rich forages (Dwivedi and Pathak 2009). Several studies have been conducted to demonstrate the usefulness of leaf meal as a component of feed rations of many farm animals. Leaf meal made from leaves of legume crops/trees/shrubs are rich in protein and could act as a replacer of feed concentrate for livestock to save the valuable feed grain as reported in case of Stylosanthes (Mojumdar *et al.* 2004). Leucaena leaf meal can be safely stored up to one year in polythene pack without declining nutrients (Dwivedi *et al.* 2010). Hence an endeavor was made to study the effect of leaf meal added feed blocks of wheat straw and to reduce the volume for transport and enhance the nutritive value of feed product.

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MATERIALS AND METHODS

Process of making feed blocks included mixing of ingredient wheat straw 70%, Stylo meal (*Stylosanthes hamata*) 15%, Subabool (*Leucaena leucocephala*) leaf meal 15%. Then, Guar gum waste powder (9%) was added into these mixed roughages as binder. Blocks were prepared using IGFRI densifying machine. Final composition of complete feed block was 64.2% wheat straw, 13.8% stylo meal, 13.8% Leucaena leaf meal and 8.2% Guar gum waste powder on weight basis.

Technology for preparation of value added feed blocks was standardized in view of the feed ingredient, animal requirement, moisture and pressure. Attempts were made to achieve the block density as 300–350 kg/m^3 and make a firm block with min post-densifying expansion. Dietary ingredients were well mixed maintaining the 20% moisture level. The mixed feed ingredients were densified by power operated IGFRI densifying machine to prepare the leaf meal added feed blocks. Average size of the blocks was 30×33×42

Table 1. Chemical composition and dietary combination of feed resources

Feed sources	CP	CF	EE	NFE	Ash	NDF	ADF	OM
Feed block	8.71	31.26	1.30	48.10	10.62	66.31	39.15	89.38
Concentrate mixture	20.52	9.98	3.72	57.48	8.30	24.81	15.09	91.70
Wheat Straw	4.09	38.73	1.24	44.54	11.40	74.68	52.96	88.60

Physical composition of diet in treatment groups: G1 : Feed block + concentrate mix (1± 0.14 kg fresh basis); G2 : Wheat straw + concentrate mix (Ratio 60:40 on wt basis).

cm and average density of blocks was 323.2 kg/m^3.

For nutritional evaluation, a feeding trial of these blocks was conducted for one month on 12 growing Bhadawari male buffaloes (average body weight 230± 19 kg) divided in 2 groups, 6 in each. After de-worming the animals were housed in well ventilated shed having the facilities of individual feeding. Group 1 was fed with value added feed blocks (G1) and group 2 fed with wheat straw and concentrate (barley 30 parts, wheat bran 34 parts, mustard cake 35 parts and common salt 1 part) in the ratio 60:40 in mash form as a control (G2). In addition, the animals of group I (G1) were given calculated amount of concentrate mixture (average 1± 0.14 kg) to make the diets isonitrogenous. After a preliminary feeding of 3 weeks feed intake pattern at 2, 4, 6, 8 and 24 hours interval was recorded by weighing the refusal of individual animal for 5 consecutive days. A digestibility trial of 7 days collection period was conducted. The feed, residues and faecal samples were collected and analysed for proximate principles (AOAC 1990) and fibre fraction (Van Soest *et al.* 1991) and data were subjected to analysis of variance (Snedecor and Cochran 1967)

RESULTS AND DISCUSSION

The chemical composition of leaf meal added feed block and concentrate mixture are presented in Table 1. Inclusion of Stylo meal (CP 14.11%) and Leucaena leaf meal (CP 19.86%) with wheat straw enhanced the CP content of feed blocks (8.71%). The quantum enhance in CP content of feed block is more than double as compared to wheat straw alone (CP 4.09%). The experimental diets fed to animal groups either in block form or mash were isonitrogenous (CP 10.61 and 10.68%) and similar OM content (89%). Palatability of diets recorded at different intervals (Table 2) revealed that DM intake after 8 hours was 89 and 85% in group 1 and 2, respectively indicating the good palatability of feed blocks as well as mash diet. Results were statistically comparable (P>0.05) in both group and corroborating the findings of Das *et al.* (2008) where the intake was 82–92% for berseem straw-based feed blocks of different compositions in 8 h.

Average daily dry matter intake (DMI) in group G1 was 2.27 kg/100kg b wt inclusive of feed block and concentrate and it was 2.51 kg/100kg b wt in G2 (Table 2). There was no significant difference in DMI between the groups. Similar pattern of DMI was reported by earlier workers (Dwivedi *et al*. 2003, 2009) in buffaloes fed wheat straw based complete feed blocks. However higher DMI observed in block form of complete diet as compared to mash form (Singh *et al*. 2007). DMD (%) was significantly (P<0.05) higher (59.20) in group G1 as compared to group G2 (51.40). Digestibility coefficient for OM, CP, NFE, NDF, DCP and TDN followed the same trend as DM digestibility.

Higher DM digestibility in feed blocks fed group might be due to inclusion of leaf meal in feed blocks leading to better rumen ecosystem/environment for the digestion of crude fibre and NDF (Mojumdar *et al.* 2004) resulting in higher DMD. In a comparative evaluation of cotton seed cake and luceana leaf meal (LLM), Barman and Rai (2003) observed higher effective degradability of both DM and OM

Table 2. Effect of leaf meal added feed blocks on feed intake and digestibility of nutrients in Bhadawari buffaloes

Parameters	Groups	
	G 1	G2
Body wt during trial (kg)	230.18±18.75	231.04±19.30
Pattern of intake		
DMI % after		
2 h	34.51±0.84	42.27±0.72
4 h	52.30±0.64	54.26±0.62
6 h	80.70±1.31	80.22±1.25
8 h	89.40±2.86	85.50±0.90
DM untake		
DM intake (kg/day)	5.77±0.17	5.24±0.21
DMI block (kg/day)	4.86±0.18	Not fed
DMI wheat straw (kg/day)	Not fed	3.14±0.22
DMI concentrate (kg/day)	0.91±0.16	2.10±0.19
DM intake (% b wt)	2.51±0.43	2.27±0.27
CP intake (kg/day)	0.61±0.18	0.60±0.19
Digestibility of nutrients		
DM	59.20±0.97^a	51.40±0.74^b
OM	61.30±0.68 ^{a}	54.20±0.57 ^{b}
CP	65.03±0.83 ^{a}	61.17±0.66 ^{b}
CF	41.40±0.23 ^{a}	35.24±0.17 ^{b}
EE	66.07±1.31	65.83±1.45
NFE	65.76±0.78 ^{a}	58.90±0.59 ^{b}
NDF	47.43±1.30 ^{a}	40.88±0.47 ^{b}
ADF	42.20±0.23	38.25±0.33
Nutritive value (%)		
DCP	6.67±0.51^a	6.21±0.44 ^{b}
TDN	55.37±0.63^a	50.10±0.57 ^{b}

as well as un-degradable protein (144.62 vs 76.89 g/kg DM) in LLM than that on cotton seed cake. Tangendjaja and Wina (2001) reported higher *in vivo* CP digestibility (77.70%) in sheep fed on LLM. Total GNC protein when replaced by LLM in the concentrate mixture of lactating goats was found to increase (P<0.01) milk yield (Rai *et al.* 1994). Densified feed blocks could save the space for storage and transport as density of blocks (323.2 kg/m^3) was 4.5 times more than density of wheat straw (71.2 kg/m^3).

It is concluded that leaf meal added feed blocks fed to Bhadawari buffaloes enhanced nutrient utilization without affecting the feed intake, and higher density of blocks permits less space for storage and transportation.

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