



SHORT COMMUNICATION

Evaluation of Distillers Dried Grains Plus Solubles as Protein Source in the Diets of Growing Crossbred Calves

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ABSTRACT

A study was conducted to evaluate the effects of dried distillers grains plus solubles (DDGS) on the nutrient utilization and growth performance of crossbred calves. Twelve crossbred female calves (Holstein Friesian × Haryana × Sahiwal) were divided randomly into 3 groups viz: T₁, T₂ and T₃ of 4 animals each, and were fed isocaloric and isonitrogenous diets according to NRC (2001) standards. Weighed quantities of wheat straw and green fodder were fed daily to each animal for an experimental period of 4 months. Mustard cake protein in the concentrates of treatment T₂ and T₃ was replaced with DDGS protein at 75 and 100% levels, respectively. 75% replacement of mustard cake protein with DDGS protein did not caused any negative effect on digestibility of crude protein, crude fibre, organic matter and neutral detergent fibre, but inclusion of DDGS in place of all mustard cake reduced the digestibility of these nutrients significantly (P<0.05). Dry matter intake remained similar among all groups. Crude protein intake increased significantly (P<0.05) while total digestible nutrient intake decreased significantly (P<0.05) at 100% replacement of mustard cake with DDGS. As compared to control feeding, average daily gain and feed intake per kg body weight gain remained unaffected in T₂ but, decreased significantly (P<0.05) in T₃. In conclusion, when used in growing calves' feed, DDGS protein at a 75% replacement level with mustard cake protein provided similar performance at a lower cost without any detrimental effects on nutrient utilization.

Key words: Crossbred calves, DDGS, Growth, Nutrient Utilization

Dried distillers grains plus solubles (DDGS) is a protein rich byproducts obtained during fermentation process in distillery plant. It can be an effective supplement for growing and lactating animals raised on forage based feeding or grazing systems (Griffin *et al.*, 2012). Recent studies also demonstrate the possibilities of use of DDGS in the feed of growing calves owing to its high protein and calorific value. Also, the bioavailability of some minerals is higher in DDGS than cereal grains (Lumpkins and Batal, 2005). The starch of grain gets consumed during fermentation, while other nutrients such as protein, fat, fiber, phosphorus and sulfur get approximately 3 times more concentrated in the DDGS compared to the original grain (Klopfenstein *et al.*, 2008). This nutrient dense ethanol byproduct can be a desirable energy and protein supplement for the different livestock species. We hypothesized that the replacement of the expensive conventional protein source in the diet of growing calves with the protein of DDGS

would economize the feeding expenditure without any detrimental effects on nutrient utilization and growth performance. The objectives of this study were to determine the effect of feeding distillers dried grains plus solubles (DDGS) protein in place of mustard cake on the digestibility and utilization of different nutrients and growth performance of growing crossbred calves.

All procedures with animals were approved by Animal Ethical Committee prior to start of the experiment. Twelve crossbred female calves were blocked by body weight (100.58±4.07 kg of BW) into 3 groups *i.e.* T₁, T₂ and T₃ of 4 animals each at the cattle farm of Department of Animal Genetics and Breeding, LUVAS, Hisar. All the calves were fed according to NRC (2001) feeding standards with concentrate mixture, dry and green fodder with free access to potable water. Within each group, calves were randomly assigned to one of the following three dietary treatments: T₁) The calves were offered required quantity of

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Table 1. Ingredient composition of different concentrate mixtures

Ingredients (Part/100kg)	Treatments		
	T ₁	T ₂	T ₃
Mustard cake	40	7	00
DDGS	00	20	26
Barley	27	35	36
De-oiled rice polish	30	35	35
Mineral mixture	02	02	02
Common salt	01	01	01
Cost (₹) per quintal	1125	1010	1000

concentrate mixture containing mustard cake (40), barley (27), de-oiled rice polish (30), mineral mixture (2) and salt (1); T₂) calves were fed concentrate mixtures in which crude protein of mustard cake was replaced at 75% levels with distillers dried grains soluble protein and, T₃) calves were fed concentrate mixtures in which crude protein of mustard cake was replaced at 100% levels with distillers dried grains soluble protein. Calves were fed experimental diets for a period of 120 days.

Body weight of the animals was on two consecutive days at the beginning and end of the experiment. fortnightly record of feed offered andorts were maintained for two consecutive days. A digestion trial of 7 days collection period was conducted to determine the apparent digestibility of nutrients. Well-mixed representative samples of concentrate, dry

and green fodder were collected. In the morning, the record of residue left and faeces voided by each animal was measured and representative samples were collected for further analysis of dry matter (DM), organic matter (OM), crude protein (CP) and ether extract (EE) as per AOAC (2007) and for neutral detergent fibre (NDF) and acid detergent fibre (ADF) according to Van Soest *et al.* (1991). Data generated was subjected to statistical analysis, which was done by FRBD with SAS, 9.3.1 (2011) version by following standard method of analysis of variance following Snedecor and Cochran (1994).

The CP and NDF contents were 21.50, 21.99 and 22.63; 32.30, 40.37 and 42.51 percent in groups T₁, T₂ and T₃, respectively (Table 1). The crude protein content in the DDGS was 43.10 % while that of the mustard cake was 34.25%. The cost of different

Table 2. Nutrient composition of concentrate mixtures and forages

Nutrient	T ₁	T ₂	T ₃	Wheat straw	Green oats
Dry Matter (%)	93.80	93.02	93.45	93.07	23.12
	% of DM*				
Organic matter	91.97	91.19	91.37	90.86	91.69
Crude protein	21.50	21.99	22.63	2.85	9.11
Ether extract	4.32	2.78	2.38	1.09	2.04
Crude fibre	8.93	8.83	8.70	39.48	28.97
Nitrogen free extract	57.52	57.59	57.66	47.44	50.57
Total ash	8.03	8.81	8.63	8.03	9.31
Neutral detergent fibre	32.30	40.37	42.51	73.12	62.18
Acid detergent fibre	13.11	15.85	15.60	50.27	34.52

*Each value is mean of three observations.

Table 3. Influence of feeding DDGS on digestibility and intake of nutrients under different dietary treatments groups

Parameters	T ₁	T ₂	T ₃
Digestibility %			
Dry matter	63.24±0.42	62.41±0.84	61.14±1.23
Crude protein	71.37 ^a ±0.41	69.94 ^a ±0.45	67.40 ^b ±1.11
Ether extract	71.59 ^a ±0.38	70.02 ^b ±0.19	69.19 ^b ±0.44
Crude fibre	51.79 ^a ±0.35	50.50 ^{ab} ±0.32	49.33 ^b ±0.73
Organic matter	66.93 ^a ±0.75	65.08 ^{ab} ±0.67	63.80 ^b ±0.38
Nitrogen free extract	70.36±1.02	70.19±1.00	69.00±0.62
Neutral detergent fibre	55.29 ^a ±0.51	53.97 ^{ab} ±1.00	52.88 ^b ±0.39
Acid detergent fibre	48.35±1.02	47.58±0.81	47.84±0.56
Nutrient intake			
Dry matter from roughage, kg/d	3.04±0.05	3.06±0.07	3.06±0.07
Dry matter from concentrate, kg/d	1.66±0.02	1.64±0.01	1.63±0.02
Total dry matter intake, kg/d	4.70±0.05	4.70±0.06	4.69±0.09
Dry matter intake (%BW)	2.82±0.04	2.79±0.03	2.83±0.06
Crude protein intake, g/d	593.60 ^a ±1.89	598.10 ^{ab} ±2.53	608.85 ^b ±2.27
Total digestible nutrients intake, kg/d	2.94 ^a ±0.02	2.87 ^{ab} ±0.04	2.80 ^b ±0.04

concentrate mixtures were ₹ 1125, 1000 and 1010/ quintal, respectively. Nutrient concentrations for different concentrate mixtures, wheat straw and oat are presented in Table 2.

Digestibility of DM, CP, EE, CF, OM and NFE was not affected significantly up to 75% replacement of mustard cake protein with DDGS protein, but at 100% replacement of mustard cake protein in the concentrate mixture of growing calves with DDGS protein led to decreased ($P<0.05$) digestibility of these nutrients. The DMI per 100 kg body weight was comparable among the groups. Intake of DCP and TDN did not differ

significantly by replacing 75% CP of mustard cake protein with DDGS in concentrate mixture of calves.

The average total body weight gain (BWG) did not differ significantly between treatment groups T₁ and T₂, but was less ($P<0.05$) in T₃. Similar pattern was observed for average daily gain (ADG) values. The feed conversion efficiency in terms of body weight gain was also not affected at 75% replacement of mustard cake with DDGS and there was a net saving of ₹ 228 per animal during the experimental period of 4 months by feeding 75% of DDGS protein in place of mustard cake protein. In a similar study, Griffin *et al.* (2012) reported

Table 4. Influence of feeding DDGS on growth performance, feed conversion efficiency and economics of feeding under different dietary treatment groups

Parameter	T ₁	T ₂	T ₃
Initial body weight (kg)	99.25±2.84	100.00±4.57	102.50±4.79
Final body weight (kg)	166.25±2.40	167.75±3.76	162.25±5.90
Body weight gain (kg)	67.00 ^a ±1.78	67.75 ^a ±2.40	62.25 ^b ±1.35
Average daily gain (g)	558.00 ^a ±14.79	564.50 ^a ±20.10	530.75 ^b ±10.25
Feed Intake per kg gain	7.20 ^a ±0.08	7.12 ^a ±0.06	7.75 ^b ±0.04
Cost of concentrate fed (₹)	2228	2000	1980
Net saving (₹)	-	228	220

increased ADG and total feed intake with DDGS supplementation in forage-based diet in growing cattle.

From the finding of the current study, it can be concluded that 75% mustard cake protein in the concentrate mixture of growing crossbred calves can be replaced with DDGS protein in an economical way without any adverse effects on the body weight gain, intake and digestibility of various nutrients. The cost of concentrate mixture reduced to ₹115 per quintal by 75% replacement of mustard cake protein with DDGS.

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