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Research Note

Effect of Feeding Sugarcane Byproduct Based Ration on Growth and Carcass Traits of Male Buffalo Calves

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An experiment was conducted to study the effect of feeding sugarcane byproduct based ration on growth, nutrient utilization and carcass characteristics of male buffalo calves. Six rations which includes five complete rations (CR-I to CR-V) and one conventional ration as control were studied. Highest average daily gain (ADG) (610.0g) was recorded in buffalo bull calves fed on complete ration-II (Sugarcane tops, maize stover and balanced concentrate mixture) when compared among the complete rations and control. The cost of production per kg live weight gain was Rs.41.14 in control group. The cost of production per kg live weight gain was insignificantly higher in control than complete rations. The cost of production per kg live weight was reduced by Rs.3.11, 8.69, 8.60, 10.92 and 8.10 for complete rations-I, II, III, IV and V, respectively, when compare to control diet. The dressing percentage on live weight was significantly ($P<0.05$) lower in male calves fed on complete rations than those fed on control ration. These results indicated that the sugarcane by-products and other crop residues can be incorporated in the complete rations in growing buffalo calves without any adverse effects. Further, utilization of agro-industrial by-products for animal production can effectively bridge the gap of roughage shortage in this country.

Keywords : *Sugarcane by-products, Murrah buffaloes males calves, Growth, Meat production, Carcass characteristics*

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India produces 265 MT of sugarcane, approximately 92.08 MT of sugarcane tops and 83.6 MT of sugarcane trash are available at disposal for economic utilization. The feed resources availability in terms of dry matter would be 511.76 and 580.81 million tons in 2011 and 2025, respectively. Corresponding figures for crude protein (CP) and total digestible nutrients (TDN) are 44.72, 265.56 and 49.48 and 300.87 million tons respectively in 2011 and 2025. However, this does not include contribution from non-conventional feed resources like agro-industrial by-products. If estimates reported in literature about non-conventional feed resources are taken in to account, the net availability of feed resources would be 526.33 and 585.55 million tons of dry matter in 2011 and 2025 respectively and corresponding figures for CP and TDN are 51.07,281.88 and 54.81 and 312.74 million tons in 2011and 2020 respectively (Ravi Kiran *et al*. 2012).

Through the technologies available, the nutritional qualities of several unconventional feed resources has been improved and are being used successfully as the major source of roughages for livestock in several regions of India. The complete diet feeding system adopted so far only in organized livestock sector improves the utilization of nutrients from crop residues and agro-industrial by-products and can supply all nutrients in required proportions since optimum ratio of concentrate to roughage is maintained by reducing wastage and increasing the consumption. The higher cost of processing complete diets as pellets or block practiced extensively now, may neutralize proportionate benefits when compared to complete feed in mash form which the farmer can easily adopt since locally available infrastructure facilities are enough for the purpose.

Twenty four male buffalo calves with an average body weight of 119.53 ± 2.37 kg were selected from the Buffalo Research Station, Venkataramannagudem, West Godavari District, Andhra Pradesh and were equally allotted at random to six groups. Five complete rations (CR) were formulated based on the *in vitro* studies CR-I (40% sugarcane tops + 20% sugarcane trash + 40% balanced concentrate mixture), CR-II (30% sugarcane tops + 30% maize stover + 40% balanced concentrate mixture), CR-III (40% sugarcane tops + 20% jowar straw + 40% balanced concentrate mixture), CR-IV (40% sugarcane tops + 20% paddy straw + 40% balanced concentrate mixture), CR-V (40% sugarcane tops + 20% sunhemp hay + 40% balanced concentrate mixture) and control ration (chopped green fodder APBN-I + concentrate mixture as per 75:25) (Table 1). The growth trial was conducted for 167 days at Buffalo Research Station,

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Venkataramannagudem, West Godavari District, Andhra Pradesh under Acharya N. G. Ranga Agricultural University. The experimental animals were maintained in individual housing system with feeding and watering arrangements through out the experimental period.

The metabolism trial was conducted in the middle of the growth trial with 5 days collection and 7 days preliminary period. Before the starting the experiment, the animals were weighed and recorded body weights and continued at every fort-nightly interval up to 168 days of the feeding experiment.

Table 1: Ingredient composition of complete rations (g/kg) selected for *in vivo* evaluation

Ingredient	Experimental rations				
	CR-I	CR-II	CR-III	CR-IV	CR-V
Sugarcane tops	400	300	400	400	400
Sugarcane trash	200	--	--	--	--
Maize stover	--	300	--	--	--
Jowar straw	--	--	200	--	--
Paddy straw	--	--	--	200	--
Sunhemp hay	--	--	--	--	200
Maize	50	58	98	--	78
	--	--	--	58	--
Gingly cake	--	80	40	70	50
Groundnut cake	168	80	140	--	--
Cottonseed cake	30	--	--	--	110
Sunflower cake	50	--	--	100	--
Green gram Chunni	--	--	--	160	--
Black gram chunni	90	170	110	--	150
Cowpea chunni	--	--	--	--	--
Mineral mixture	8	8	8	8	8
	4	4	4	4	4
CP (%)	12.75	12.70	12.75	12.77	12.61

The roughage portion of different combinations of sugarcane tops and trash,maize stover, jowar straw, paddy straw and sunhemp hay were decided based on the IVDMD% values some complete rations were 40:20 and one complete ration as 30:30

Three representative animals from each group were slaughtered at the end of growth trial to study the carcass characteristics like dressing percentage, hot carcass weight, weight of edible and non-edible organs etc. All the observations were recorded for the parameters indicated in the experiment.

The animals were slaughtered by "Halal" method after overnight feed withdrawal. The live weights of animals were recorded before slaughter.The stripping, legging, dressing and evisceration were performed by adopting the standard procedure described by Gerrard (1964).

The weights of hot carcass, edible (liver, heart, testes, diaphragm, kidney and spleen) and non-edible organs (lungs, trachea, stomach and intestines) were recorded.

The carcass was then divided into 5 cuts viz., leg, loin, rack, shoulder and neck and fore shank and brisket as suggested by the National Livestock and Meat Board of United States of America (Brandly *et al*. 1968). The experiment was designed Randomized Block Design (RBD) and statistical analysis of the data was taken as per standard methods (Snedecor and Cochran 1976).

The daily average dry matter intake (DMI) and nutrient digestibility on 6 experimental complete rations are presented in Table 2. The statistical analysis revealed that the DM digestibility coefficients, average daily gain (ADG) and the total gains were significantly ($P<0.01$) higher in calves fed with experimental complete rations than those fed with control ration. The cost of production per kg live weight gain was

Rs.41.14 in control group. The cost of production per kg live weight gain was insignificantly higher in control than complete rations. The cost of production per kg live weight was reduced by Rs.3.11, 8.69, 8.60, 10.92 and 8.10 for complete rations-I, II, III, IV and V, respectively, when compare to control diet.

Table 2: Performance of graded Murrah buffalo calves fed on sugarcane by- product based complete rations

Attribute	Experimental rations					Control
	CR-I	CR-II	CR-III	CR-IV	CR-V	
Initial body weight(Kg.)	118.93± 6.63	118.63± 7.90	120.10± 6.78	119.36± 3.94	129.23± 6.60	110.96± 17.48
Final body weight (Kg.)*	214.96^{a}± 2.90	234.66^{a}± 20.48	233.93^{a}± 20.52	220.90^{a}± 7.91	220.56^{a}± 5.99	180.26^{b}± 23.99
Avg. Total gain in Body wt. (Kg.)*	96.03^{a}± 1.90	116.03^{a}± 17.02	113.83^{a}± 9.88	103.32^{a}± 6.42	91.33^{a}± 5.88	69.29^{b}± 4.84
Avg. Daily gain in body wt. (Kg.)**	0.505^{a}± 0.10	0.610^{a}± 0.10	0.599^{a}± 0.05	0.543^{a}± 0.03	0.480^{ab}± 0.04	0.365^{b}± 0.02
DMI per 100kg Body wt.	2.62± 0.07	2.49± 0.15	2.47± 0.14	2.60± 0.05	2.56± 0.02	2.70± 0.37
Avg. Metabolic body wt.(kg)$W^{0.75}$	56.13^{a}± 0.69	59.88^{a}± 2.80	59.74^{a}± 2.78	57.28^{a}± 1.08	57.22^{a}± 0.82	49.06^{b}± 3.48
DMI/kg. Metabolic body wt.(Kg.)$W^{0.75}$	100.41± 2.24	96.92± 4.40	96.57± 3.99	100.24± 1.61	98.67± 0.61	98.36± 10.15
Feed efficiency(Kg.)	11.15± 0.10	10.24± 1.83	9.78± 0.78	10.68± 0.71	11.80± 0.42	13.24± 1.43
Cost/Kg. Ration(Rs.)	3.41	3.17	3.33	2.83	2.80	3.10
Total feed cost/day(Rs.)	19.20± 0.23	18.27± 0.08	19.10± 0.23	16.23± 0.15	15.80± 0.17	14.75± 0.03
Cost/Kg. live wt. gain(Rs.)	38.03± 0.33	32.45± 5.80	32.54± 2.59	30.22± 2.03	33.04± 1.17	41.14± 4.45

Each value is the average of 4 observations
values bearing different superscripts in a row differ significantly($P<0.01$)** ($P<0.05$)*

The average daily gain (ADG) in experimental buffalo calves fed complete diets ranged from 0.365 ± 0.02 to 0.610 ± 0.10 kg (Table 2). The average daily gains were significantly ($P<0.01$) higher in growing calves fed on sugarcane by-products based complete rations by 31.51 to 67.12 per cent than in calves fed conventional diet. These results are in agreement with the results in buffalo heifers and in crossbred bulls (Reddy *et al*. 1993).The results of the present study did not corroborate with the results of the daily live weight gains of 206 and 402 g/ animal/day and these were lower than the present study (Fundora *et al*. 1999). This might be due to higher feed efficiency in the experimental groups when compared to control. Further it is observed that the processed diets had a better digestibility of proximate nutrients, higher intakes of DM, which might have resulted in higher growth rates. The feed consumed per kg live weight gain ranged from 9.78 ± 0.78 to 11.80 ± 0.42 kg DM among the complete diets, which was lower ($P>0.05$) that of control ration (13.24kg) in the present study. The DM consumed per kg live weight gain was lowest in CR-III (9.78 kg) when compared to control (13.24 kg). Similar to the present findings, higher efficiency in crossbred heifers fed sugarcane harvest residue based complete diets compared to control group (Fundora *et al*. 1999).

The cost of complete ration per kg live weight gain was higher for control diet than complete diets though it was not significantly different. The cost of complete ration per kg live weight gain was reduced by Rs. 2.43, 8,01, 7.82, 10.24 and 7.42 for complete rations-I, II, III, IV and V, respectively when compared to conventional diet. In a similar study results reported that the cost of feed/kg gain was lower with complete diets than the control diet (Singh *et al*. 2000).

At the end of growth experiment three representative animals from each group were slaughtered to elicit the carcass characteristics.

The average weights of calves slaughtered ranged from 159.8 to 225.8 kg. The mean weight of hot carcass yield for bull calves ranged from 70.76 to 94.46 kg and dressing percentage ranged from 44.93 per cent to 45.68 per cent (Table 3). The lower dressing percentage recorded in bull calves fed with experimental complete rations in the present study might be due to higher

percentage of non-edible organs as reported (Reddy *et al*. 2003) where in effect of feeding cotton stalks based complete diet on growth and carcass characteristics in sheep and goats was studied under field conditions. In a similar study results reported mean dressing percent ranging from 51.45 to 53.93 in buffalo calves fed at different protein levels of complete diets (Sarma and Sarma 1997).

The proportions of hot carcass weights were highest in CR-II (94.46 kg) whereas, in others it ranged from 70.76 to 75.90 kg. It might be due to highest feed intake and digestibility in that group of animals. The weight of edible organs ranged from 2.71 ± 1.05 to 4.06 ± 0.04 kg in buffalo calves fed complete diets which was higher significantly (P<0.01) in CR-I, CR-II, CR-IV and CR-V and non-significantly (P>0.05) in CR-III compared to conventional ration. However, non-edible organs (kg) were comparable between buffalo calves fed experimental and control ration with increased trend towards buffalo calves fed complete rations.

The ratio of edible and non-edible organs was comparable among the treatment groups (Table 3). The ratio of non-edible organs to edible organs was lower in calves fed experimental complete rations than the calves fed conventional ration. The quantity of edible organs was more in CR-V, when compared to other complete rations and conventional diet.

Table 3: Carcass characteristics of experimental male buffalo calves fed on sugarcane by-products based complete rations

Attribute	Experimental rations					Control
	CR-I	CR-II	CR-III	CR-IV	CR-V	
No. of animals slaughtered	3	3	3	3	3	3
Avg. Body wt.(Kg.)**	$212.37^{a} \pm 3.40$	$223.90^{a} \pm 17.01$	$216.83^{a} \pm 10.10$	$213.80^{a} \pm 0.92$	$225.83^{a} \pm 2.32$	$159.80^{b} \pm 12.18$
Avg. empty body wt.(Kg.)**	$208.96^{a} \pm 3.25$	$220.16^{a} \pm 16.69$	$213.23^{a} \pm 9.99$	$210.20^{a} \pm 0.87$	$222.10^{a} \pm 2.35$	$157.20^{b} \pm 12.01$
Hot carcass wt.(Kg.)**	$74.96^{b} \pm 3.03$	$94.46^{a} \pm 0.96$	$74.60^{a} \pm 6.09$	$75.90^{b} \pm 4.38$	$74.53^{b} \pm 0.64$	$70.76^{b} \pm 1.46$
Dressing % on live wt.(Kg.)*	$35.33^{ab} \pm 1.75$	$42.68^{a} \pm 3.24$	$34.28^{b} \pm 1.23$	$35.50^{ab} \pm 2.12$	$32.95^{b} \pm 0.25$	$34.63^{b} \pm 4.35$
Edible organs(Kg)*	$3.57^{a} \pm 0.19$	$3.55^{a} \pm 0.37$	$2.71^{b} \pm 1.05$	$3.83^{a} \pm 0.01$	$4.06^{a} \pm 0.04$	$2.68^{b} \pm 0.12$
Non-Edible organs(Kg.)	23.10± 0.45	24.86± 1.60	23.73± 0.37	24.46± 0.47	24.03± 0.08	21.56± 0.17
Edible : Non-Edible organs	1:6.57	1:7.00	1:8.75	1:6.38	1:5.92	1:8.03

Each value is the average of 3 observations
values bearing different superscripts in a row differ significantly(P<0.01)** (P<0.05)*

Sugarcane by-products can be utilized effectively to buffalo calves production which, intern increase the animal protein availability for the human community.

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