International Journal of Research in Engineering and Applied Sciences(IJREAS)
Available online at http://euroasiapub.org/journals.php
Vol. 7 Issue 1,January7, pp. 38~45
ISSN (O): 2249-3905, ISSN(P) : 2349-6525 | Impact Factor: 6.573 | Thomson ReutersResearcher ID: L-5236-2015

UTILIZATION OF SUGARCANE BY-PRODUCTS AS COMPLETE RATIONS FOR MEAT PRODUCTION IN BUFFALOES

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ABSTRACT

A growth trial was conducted to study the effect of feeding sugarcane byproducts based complete ration on carcass characteristics of 24 Murrah buffalo bull calves. The bull calves were divided into six groups randomly in a Randomized Block Design and fed six rations comprising of five complete rations (formulated by using sugarcane by-products and other crop residues) and one conventional ration (containing chopped hybrid Napier and concentrate mixture) and balanced concentrate mixture in the mash form for a period of 168 days. The results revealed that the average daily gain of 480 to 610 g was observed in calves fed with sugarcane by-product based diets with an intake level of 2.51 to 2.57 kg (Kg/100 kg body weight) and showed greater weight gains when compared to control group (364 g of growth rate). At the production level of 3 tons of SCT hay per acre, one acre of sugarcane crop can support 8 buffalo calves during the harvesting season. The dressing percentage on empty body weight ranged from 33% to 45%, indicating that the feeding of sugarcane by products and other crop residues based complete ration yielded the dressing percentages within the normal range without showing any adverse effects on growth performance of Murrah buffalo bull calves.

Keywords: Carcass characteristics, Dressing percentage, Meat production, Murrah buffalo bull calves, Sugarcane by-products.

Introduction

Developing a feeding system using crop residues or agro-industrial by-products will not only lower the cost of animal feed and improve the economic efficiency of animal production, but also reduce the environmental pollution caused by the disposal of these organic wastes (Kajikawa, 1996). The issue of bio energy (seeking a source of renewable energy), is a serious issue in Brazil and has led to a big rush to increase ethanol production, which in turn has increased the size of areas planted with sugar cane; thereby leading to the production of more waste from distillation. Within this new scenario, it creates the need for more detailed nutritional information on the use of such waste in ruminant feed (Barros et al., 2009). To improve animal productivity, it is important to use proper food handling technique (especially in the dry seasons of the year) and adopt intensive systems of exploitation, such as confinement or semi-confinement; making it necessary to rely on food of good nutritional value and low cost. One way to achieve this is the use of agro-products, but most of these foods have not been studied, and their compositions and appropriate concentrations for economic and biological use in animal. 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.Bulle et al., 1999, studied the effect of use of bagasse as the only source of bulk for crossbred bulls. Feed and fodder scarcity is a major limiting factor in developing countries resulting in low productivity, poor growth and reproduction of animals (Krishnamoorthy and Moran, 2011). Currently in India, there is a deficit of feed resources to the tune of 7.58%, 56.73% and 30.37% for dry roughages, green grasses and concentrates respectively (Ramachandra et al., 2007). The high demand for animal products could only be met in a sustained manner through the efficient use of crop residues and unconventional feed resources that do not compete with human food (Makkar, 2003).

Materials and Methods

Required quantity of sugarcane (*Sacharamafficinarum*) by-products *viz*., sugarcane (7805) tops and trash were procured from the farmers fields of sugarcane production areas surrounding the Buffalo Research Station, Venkataramannagudem, and remaining crop residues like maize stover (*Zea mays*), jowar straw (*Sorghum bicolor*), Paddy straw (*Oryza sativa*) and sunhemp hay (*Crotalaria juncea*) and Pillipesara (*Phasiolus mongo*) were procured within the Research Station and paddy straw was procured from the Agricultural Research Station, Maruteru. The concentrate feed ingredients were procured from the local market. The growth trial was conducted for 168 days on graded Murrah buffalo bull calves at Buffalo Research Station, Venkataramannagudem, West Godavari District, Andhra Pradesh under Acharya N. G. Ranga Agricultural University. Twenty four growing buffalo bull calves with an average body weight of 119.53±2.37kg were selected from the Buffalo Research Station, Venkataramannagudem, West

Godavari District, Andhra Pradesh and were equally allotted at random to six groups. The experimental animals were maintained in individual housing system with feeding and watering arrangements throughout the experimental period. Before the starting the experiment, the animals were weighed and recorded body weights and continued at every fort-nightly interval upto 168 days of the feeding experiment.

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 starving. The live weights of animals were recorded before slaughter. 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).

Results and Discussion

The average daily weight gains of growing buffalo bull calves fed with complete rations I, II, III, IV, VI during the period of growth study were 0.505 ± 0.01, 0.610 ± 0.10, 0.599 ± 0.05, 0.543 ± 0.03, 0.480 ± 0.04, respectively, which were significantly higher than the control, 0.365 ± 0.02 kg (Table 2) on par with the total gains of 96.03 ± 1.90, 116.03 ± 17.02, 113.83 ± 9.88, 103.32 ± 6.42, 91.33 ± 5.88 and 69.29 ± 4.84 kg in calves fed with complete rations CR-I, II, III, IV, VI and control ration, respectively. The results obtained in the present study were in agreement with Prasanna et al., 2015, who found higher total body weight gains in the buffalo bull calves fed sheanut cake based complete rations than the control diet. Prasanna et al., 2015 also reported that the buffalo bull calves fed sugarcane byproducts based ration showed the higher total body weight gains than the control diet.

The average cost per kg live weight gain in calves fed experimental complete rations varied significantly (Table 2). The average cost was observed to be Rs. 38.03 ± 0.33, 32.45 ± 5.80, 32.54 ± 2.59, 30.22 ± 2.03, 33.04 ± 1.17 and 41.14 ± 4.45 for CR-I, CR-II, CR-III, CR-IV, CR-VI and control rations, respectively, which was decreased by 7.56, 21.12, 20.90, 26.54 and 19.96 per cent units in CR-I, CR-II, CR-III, CR-IV, CR-V when compared to control ration. The cost per kg ration was lower in the sugarcane byproducts based complete diets (Rs 3.41, 3.17, 3.33, 2.83 and 2.80 in CR-I, CR-II, CR-III, CR-IV, CR-V, respectively) than the conventional diet (Rs 9.25). Hence the cost per kg live weight gain (Rs) was lower with complete diets than the control diet. The similar results were observed with Singh et al., 2000.

Prasanna et al., 2015 also found the cost of complete ration per kg live weight gain was higher for control diet than experimental diets.

The average daily gain (ADG) in experimental buffalo calves fed complete diets ranged from 0.365 ± 0.02 to 0.610 ± 0.10 kg. The average daily gains did not differ significantly (P<0.01) among the buffalo bull calves fed on sugarcane by-products based complete rations but was found to be lowest in the calves fed conventional diet. These results are similar to the results obtained by Naik and Sengar, 1998 in buffalo heifers, Reddy et al., 1993 in crossbred bulls and Prasanna et al., 2015 in male buffalo calves fed sugarcane byproducts based ration. 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 drymatter intake per day per head ranged from 5.64 to 5.77 kg among the complete diets, which was higher (P>0.01) that of control ration (3.89kg). The present findings were in agreement with the Fundora O Stuart et al., 1999a who found higher efficiency in crossbred heifers fed sugarcane harvest residue based complete diets compared to control group.

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 on live weight and empty body weight ranged from 32.95 to 44.93 per cent and 33.5 to 45.68 per cent, respectively (Table 3). The dressing percentages on live weight (kg) and empty body weight were significantly higher in calves fed CR II (42.68%, 43.4%), than the calves fed conventional diet (35.33%, 35.9%), which were lower than the dressing percentages (ranging from 52.29 to 54.27% on live weight and 64.20 to 66.82% on empty body weight basis in male murrah buffalo calves fed SNC based diets) observed by Prasanna et al., 2015. The results were on par with the results obtained by Prasanna et al., 2015 who also found lower dressing percentages in the male buffalo calves fed sugarcane by products based experimental diet compared to control diet group. Prasanna et al., 2016, found the higher dressing percentages in the lambs fed SNC and probiotic based diets than the control group. The percentages of inedible organs were found to be higher in the calves fed experimental rations compared to control diet group. Reddy et al., 2003 also found higher percentage of non edible organs in the ongole bull calves fed processed complete diet containing sugarcane bagasse. The hot carcass weight was observed to be significantly higher in calves fed CR-II (94.46 kg). The ratio of non-edible organs to edible organs was lower in calves fed experimental diet than the conventional diet.

Table 1: Per cent ingredient composition of FIVE complete Rations (CR) Formulated using Sugarcane by-products with other crop residues

and concentrate feed ingredients for feeding of buffalo bull calves

Name of Ingredient	**CR – I**	**CR – II**	**CR – III**	**CR – IV**	**CR - V**	**Control***
Sugarcane tops (dried)	40	30	40	40	40	-
Sugarcane trash	20	-	-	-	-	-
Sugarcane trash (urea treated)	-	-	-	-	-	-
Maize stover	-	30	-	-	-	-
Jowar straw (Kadbi)	-	-	20	-	-	-
Paddy straw	--	--	-	20	-	-
Sunhemp Hay	--	--	--	--	20	-
Maize grain	5	5.80	9.80	--	7.80	-
Bajra grain		-		5.80		-
Jowar grain		-				-
Groundnut cake	16.80	8.00	14.00	--	--	-
Cottonseed cake	1.50		--	--	11	-
Sunflower cake	2.50		--	5.00		-
Gingily cake		2.00	2.00	3.50	5.00	-
Black gram chunni	4.50	8.50	5.50	--	15	-
Green gram Chunni	-			8.00		-
Mineral Mixture	0.80	0.80	0.80	0.80	0.80	
Salt	0.40	0.40	0.40	0.40	0.40	-
Vitamin A, D3	20 g	20 g	20 g	20 g	20 g	-
Total :	100	100	100	100	100	-

**Calves are fed with ad libitum green fodder and 2 kg of concentrate mixture (Traditional feeding)*

Table 2: Performance of growing Murrah buffalo bull calves fed with various sugarcane by-product based complete rations

ATTRIBUTE	Control	Experimental Rations				
		CR-I	CR-II	CR-III	CR-IV	CR-V
No. of experimental animals	4	4	4	4	4	4
Initial body wt (Kg)	110.96 ± 17.48	118.93 ±6.63	118.63 ±7.90	120.10 ±6.78	119.36 ±3.94	129.23 ±6.60
Final body wt (Kg)	180.26 ^{b} ± 23.99	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
Av Total gain in Body wt (Kg)	69.29 ^{b} ± 4.84	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
Av daily gain in Body wt (Kg)	0.365 ^{ab} ±0.02	0.505 ^{a} ±0.01	0.610 ^{a} ±0.10	0.599 ^{a} ±0.05	0.543 ^{a} ±0.03	0.480 ^{a} ±0.04
Av metobolic body Wt (Kg) $W^{0.75}$	49.06 ^{b} ± 3.48	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
DMI/day/head (Kg)	3.892 ^{b} ±019	5.633 ^{a} ±0.14	5.766 ^{a} ±0.05	5.737 ^{a} ±0.13	5.737 ^{a} ±0.10	5.645 ^{a} ±0.08
DMI/Kg 100 Kg body wt (Kg)	2.22 ±0.24	2.62 ±0.07	2.49 ±0.15	2.47 ±0.14	2.60 ±0.05	2.56 ±0.02
DMI/Kg Metobolic body wt (Kg) $W^{0.75}$	1.06 ^{b} ±0.04	1.47 ^{a} ±0.20	1.47 ^{a} ±0.01	1.46 ^{a} ±0.02	1.48 ^{a} ±0.01	1.46 ^{a} ±0.01
Feed efficiency (Kg)	10.85 ±0.98	11.15 ±0.10	10.24 ±1.83	1.78 ±0.78	10.68 ±0.71	11.80 ±0.42
Cost/Kg Ration (Rs)	9.25 ^{a}	3.41 ^{b}	3.17 ^{d}	3.33 ^{c}	2.83 ^{e}	2.80 ^{f}
Total feed cost/Day (Rs)	14.76 ^{d} ±0.02	19.20 ^{a} ±0.23	18.27 ±0.08	19.10 ^{a} ±0.23	16.23 ^{c} ±0.15	15.80 ^{c} ±0.17
Cost/Kg Live wt gain (Rs)	40.46 ^{a} ±0.05	38.03 ^{a} ±0.33	32.45 ^{b} ±5.80	32.54 ^{b} ±2.59	30.22 ^{bc} ±2.03	33.04 ^{b} ±1.17

Table 3: Carcass characteristics data of male buffalo calves fed on different experimental rations

Sl. No	Parameter	Experimental Rations					
		CR1	CR2	CR3	CR4	CR5	Control
1	Av. body wt (kg)	212.37[a] ± 3.4	223.9[a] ±17.01	216.83[a] ±10.10	213.8[a] ±0.92	225.83[a] ± 2.32	159.8[b] ±12.18
2	Av. empty body wt (kg)	208.96 [a] ±3.25	220.16 [a] ±16.69	213.23 [a] ±9.99	210.2 [a] ±0.87	222.1 [a] ± 2.35	157.2 [b] ±12.01
3	Hot carcass wt (kg)	74.96 [b] ±3.03	94.46 [a] ±0.96	74.6 [b] ±6.09	75.9 [b] ±4.38	74.53 [b] ±0.64	70.76 [b] ±1.46
4	Dressing % on live wt (kg)	35.33[ab] ±1.75	42.68 [a] ±3.24	34.28 [b] ±1.23	35.5 [ab] ±2.12	32.95 [b] ±0.25	44.93 [a] ±4.35
5	Dressing % on empty body wt (kg)	35.9 [ab] ±1.75	43.4 [a] ±3.29	34.86 [b] ±1.24	36.11[ab] ±2.14	33.5 [b] ±2.61	45.68 [a] ±4.43
6	Edible organs (kg)	3.571 [a] ±0.19	3.55 [a] ±0.37	2.71 [a] ±1.05	3.834 [a] ±0.01	4.057 [a] ±0.04	2.683 [b] ±0.12
7	Non Edible organs (kg)	23.1 ±0.45	24.86 ±1.6	23.73 ±0.37	24.46 ±0.47	24.03 ±0.08	21.56 ±0.17
8	Edible: non edible organs	1:6.47	1:7.00	1.875	1:6.38	1:5.92	1:8.03

Means bearing different super scripts in the row differ significantly (P<0.01)

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