P© 2011, Scienceline Publication

Online Journal of Animal and Feed Research

Volume 2, Issue 4: 332-339 (2012) ISSN 2228-7701

EFFECT OF SUPPLEMENTATION OF CONCENTRATE TO SWEET SORGHUM (*Sorghum Bicolor* L. Moench) BAGASSE LEAF RESIDUE SILAGE ON PERFORMANCE AND CARCASS CHARACTERISTICS IN NATIVE SHEEP

B. VIDYA[1]*, Y. RAMANA REDDY[2] , D. SRINIVASA RAO[3]

[1]*PhD Scholar, Department of Animal Nutrition, C.V.Sc, Rajendranagar, Hyderabad-50030, India*
[2] *Associate Professor, Department of Animal Nutrition, C.V.Sc, Rajendranagar, Hyderabad-50030, India*
[3] *Professor and Univ.Head, Department of Animal Nutrition, C.V.Sc, Rajendranagar, Hyderabad-50030, India*

*Email: anumoluvidya@gmail.com

ORIGINAL ARTICLE

ABSTRACT: *The effect of supplementation of concentrate at different levels to sweet sorghum leaf residue (SSBLR) silage on the performance, and carcass characteristics was studied using Nellore growing ram lambs in a 120 day growth trial. A randomized design was applied with groups of seven growing ram lambs (14.05±0.61) and age (4 months), blocked by weight, allocated to one of four treatments; SSBLR silage ad lib (R-1), SSBLR silage + concentrate 170 g (R-2), SSBLR silage + concentrate 225 g (R-3) and SSBLR silage + concentrate 280 g (R-4). At the end of growth trial five representative lambs from each group were slaughtered to study the carcass characteristics and meat quality. The CP NDF and ADF content of SSBLR silage was 7.48, 71.81 and 46.75 per cent, respectively. The average daily gain (ADG) of ram lambs fed ration R-4 were significantly (P<0.01) higher than those fed R-1 and R-2 ration, but the value was comparable with the R-3 ration. The total DMI (g/d) was significantly (P<0.01) higher in lambs fed R-2, R-3 and R-4 rations compared to R-1 ration but DMI (g/d or % b.wt.) from SSBLR silage was not influenced by the level of concentrate supplementation. Negative FCR was recorded in lambs fed sole SSBLR silage and FCR was improved with supplementation of concentrate from R-2 to R-4 rations. Significant difference (P<0.05) in FCR was observed between lambs fed R-2 and R-3, R-4 rations but there was no significant difference between the lambs fed R-3 and R-4 rations. The lambs fed sole SSB silage lost their body weight of 2.14 kg during experimental period resulting in negative ADG and negative FCR. Supplementation of concentrate at 280 g to SSBLR silage resulted in significantly lower cost/kg gain than the other rations. Carcass weight and dressing percentage was linearly (P<0.01) increased as the proportion of concentrate increased in the diet. Supplementation of concentrate at different levels did not significantly influence the per cent whole sale cuts, yield of visceral organs and proportion of meat, bone and fat in whole carcass and chemical composition of meat. The results of the present study indicated that supplementation with energy and protein rich feeds to SSBLR was necessary and concentrate supplementation at 280 g to SSBLR silage found to be optimum for better growth rate, feed efficiency and meat quality in growing Nellore ram lambs.*

Key words: *Sweet sorghum bagasse leaf residue silage, Supplementation, Performance, Carcass characteristics, Sheep*

INTRODUCTION

India ranks third in the world in sheep population and has about 73.99 million sheep and 154 million goats (FAO, 2010). Small ruminants in India mainly depend on grazing and browsing resources to meet their nutrient requirements. However, due to continuous depletion of grazing land they are subjected to severe nutritional stress, adversely affecting their production performance. Full utilization of crops and their by-products in the balanced production of food, feed and industrial products is likely to become increasingly important in India. Hence, it is necessary to explore the possibility of utilizing newer feed resources for feeding ruminant livestock.

Sweet sorghum (*Sorghum bicolor* L. Moench) is one of the most efficient dry land crops. The crop is more water–use efficient than sugarcane and is recently gaining importance as a feedstock for ethanol production (Reddy et al., 2005). Use of sweet sorghum bagasse leaf residue (SSBLR) - that remain after juice extraction could mitigate fodder shortage and add further value to a sweet sorghum bio-fuel value chain as a tradable feed resource

To cite this paper: Vidya, B., Ramana Reddy, Y. and Srinivasa Rao, D. 2012. Effect of supplementation of concentrate to sweet sorghum (Sorghum bicolor L. Moench) bagasse leaf residue silage on performance and carcass characteristics in native sheep. *Online J. Anim. Feed Res.*, 2 (4): 332-339.
Scienceline/Journal homepages: http://www.science-line.com/index/; http://www.ojafr.ir

(Blummel et al., 2009). In bio-ethanol production systems in India (and elsewhere) SSBLR are generated in large amounts. A crop yielding 40 ton fresh stalk/ha and 50 per cent extractability would yield about 20 tons/ha SSBLR. Under such conditions SSBLR can be converted to silage and stored for feeding livestock. In fact SSBLR is good for silage making (Rao et al., 2008) since it contains 50% moisture after extraction of juice.

In view of the above, the present study is aimed to evaluate the effect of supplementation of concentrate to SSBLR silage on growth performance and carcass characteristics in native sheep.

MATERIALS AND METHODS

Cropping conditions of sweet sorghum

Sweet sorghum is a warm-season crop that matures earlier under high temperatures and short days. It tolerates drought temperature stress better than many crops, but it does not grow well, under low temperatures. It can be grown on soils ranging from heavy clay to light sand. Rainfall of 500 – 600 mm distributed ideally across growing period is the best, unless the soil can hold much water. Seed rate is 7-8 kg seed/ha with a recommended density about 7000 plants/ha. Most of the sweet sorghum varieties mature between 115-125 days during rainy season. Sweet sorghum yields 25-75 ton/ha green matter, according to soil fertility and rainfall.

Site of study

The experiment was carried out at the College of Veterinary Science of S V Veterinary University, Rajendranagar, Hyderabad, India (17^0 12′ N, 78^0 18′ E, 545 m above sea level) in India. The ambient temperature and relative humidity values during the period of study were in the ranges of 33- 44^{o}C and 29-36 %, respectively.

Experimental feeds preparation

Sweet sorghum bagasse leaf residue (SSBLR) procured from decentralized crushing unit of ICRISAT, Patancheru, established at Daulathabad, Medak dist under National Agriculture Innovation Project (NAIP, Component- 2) in chopped form after extraction of juice. The chopped bagasse is made into silage in a trench type of silo with dimensions of 12'l x 9' w x 6'h so as to accommodate about 10 tons of silage. Sugarcane molasses, urea (fertilizer grade) and common salt were added at 1, 0.5 and 0.5 per cent respectively while making the silage and they were mixed in water (50 l/ton) thoroughly with stick and were sprinkled uniformly on each layer of the chopped SSB in the silo. Great care was taken while compacting and sealing the chopped SSB to prevent trapping of air in the silo so as to maintain strict anaerobic environment in the silo. Silo was opened on 30th day after sealing for the feeding of experimental ram lambs. Concentrate mixture (CP 17%; ME 10.6 MJ/kg DM) was prepared using locally available feed ingredients (Table 1).

Table 1 - Ingredient composition (g/kg) of concentrate mixture

Ingredient	Level (g/kg)
Maize grain	310.0
Ground nut cake	165.0
Sunflower cake	200.0
Deoiled rice bran	230.0
Molasses	50.0
Urea	15.0
Mineral mixture*	20.0
Salt	10.0

*contains calcium-30 %, phosphorous-9 %, magnesium-2.114 g, Copper-312 mg, cobalt-45 mg, iron-979 mg, zinc 2.130-g, iodine-156 mg, D.L. methionine-1.929 g L.lysine-4.40 g

Experimental animals, housing and feeding management

Twenty eight ram lambs with an average body weight of 14.05±0.61 aged about 4 months were divided into 4 groups each group comprising of 7 lambs in a Completely Randomized Design (CRD). The following treatments were allotted at random to the 4 groups of Nellore ram lambs. The first group (R-1) of growing Nellore ram lambs was fed sole SSBLR silage *ad libitum.* The second group (R-2) was fed concentrate mixture @ 170 g (approximately 30% of the total dry matter intake (DMI)) + SSBLR silage *ad lib.* The third group (R-3) was fed concentrate mixture @ 225 g (approximately 40% of the total DMI) + SSBLR silage *ad lib.* The fourth group (R-4) was fed concentrate mixture @ 280 g (approximately 50% of the total DMI) + SSBLR silage *ad lib.* The lambs were de-wormed and vaccinated against Peste des petits ruminants (PPR) and enterotoxaemia diseases before inducting into the 120-d growth trial and housed in well ventilated pens (4m x 3m) with facilities for feeding and watering. During the study hygienic conditions were maintained in the pens by draining appropriately to allow the water to run off, and they were regularly cleaned. Experimental feeds were offered 3 times at equal intervals in a day and fresh drinking water was made available *adlibitum* at all times. During the growth trial period experimental ram lambs were weighed at fortnightly intervals for two consecutive days in the morning before feeding and watering. Daily feed intake was recorded by weighing the feed offered and refusals. Samples of offered feed and left over were collected biweekly and analyzed for proximate principles (AOAC, 1997) and fiber fractions (Van Soest et al., 1991).

To cite this paper: Vidya, B., Ramana Reddy, Y. and Srinivasa Rao, D. 2012. Effect of supplementation of concentrate to sweet sorghum (Sorghum bicolor L. Moench) bagasse leaf residue silage on performance and carcass characteristics in native sheep. *Online J. Anim. Feed Res.*, 2 (4): 332-339.
Scienceline/Journal homepages: http://www.science-line.com/index/; http://www.ojafr.ir

Slaughter procedures

After growth trial, five animals from each group were randomly selected for carcass studies. The lambs were fasted for 18 hrs with free access to water and slaughtered as per the standard procedures by Halal method. The live weights before slaughter were recorded. Stripping, legging, dressing and evisceration were performed by adopting the standard procedures described by Gerrand (1964). Carcass, edible (Testicle, spleen, pancreas, kidney, heart, liver) and non edible (Head, skin, fore and hind canons, lungs with trachea, gall bladder, penis, empty GI tract) offal weights were recorded immediately after slaughter. Lungs, trachea and heart were weighed as one piece and designated as pluck. Weight of ingesta was determined as the difference between full and empty digestive tract. The empty live weight was computed as the difference between pre slaughter weight and weight of digestive content. The hot carcass was then split to fore and hind quarters. The fore and hind quarters were further split along the mid line and the left half was disjointed as per ISI (1963) specifications to standard wholesale cuts viz. leg, loin, rack, neck and shoulder and breast and fore shank. The meat samples were collected from *Longissmus dorsi* muscle immediately after slaughter for qualitative analysis. The samples were analyzed for moisture, protein, fat and ash according to methods of A.O.A.C. (1997).

Statistical analysis

Statistical analysis of the data was carried out according to the procedures suggested by Snedecor and Cochran (1994). Least-square Analysis of variance was used to test the significance of various treatments and the difference between treatments means was tested for significance by Duncan's new multiple range and F Test (Duncan, 1955).

RESULTS AND DISCUSSION

Chemical composition

DM (34.83) and CP (7.48) content of SSBLR silage (Table 2) was higher than the DM and CP (5.0) content of ensiled corn crop residue as reported by Lopez-Guisa et al. (1991) and it may be due to addition of urea to the SSBLR while making silage. The OM, CF, EE, NFE were comparable, where as NDF, ADF and hemicellulose of SSB silage were higher than the values of sorghum stover silage reported by Sudesh Radotra and Upadhay (2005). The lignin content of SSB silage was comparable with the values of corn crop residue silage (Lopez-Guisa et al., 1991).

Table 2 - Chemical composition (% DM) of SSBLR silage and concentrate mixture

Nutrient	% level	
	SSB silage	Concen. mixture
Proximate principle		
Dry matter	34.83	89.50
Organic matter	92.46	88.31
Crude protein	7.48	17.27
Ether extract	1.99	3.45
Crude fibre	37.14	9.34
Nitrogen free extract	45.86	58.25
Total ash	7.53	11.68
Cell wall constituents		
Neutral detergent fibre	71.81	32.05
Acid detergent fibre	46.75	13.32
Hemicellulose	25.06	18.73
Cellulose	31.16	7.09
Acid detergent lignin	9.05	3.11

Each value is the average of triplicate analysis. On dry matter basis except for dry matter

Body weight changes and growth rates

There was decrease in live body weight of lambs fed sole SSBLR (R-1) silage and the lambs lost on an average 2.14 kg body weight by the end of the trial. ADG increased (Table 3) progressively either significantly ($P<0.01$) or non significantly as the level of concentrate supplementation increased and the increased ADG might be due to significantly higher CP digestibility and DCP and ME intakes by the lambs fed R-2, R-3 and R-4 rations. Abdul et al. (2008) reported that animals fed on the supplement gain weight while those not supplemented lost weight. Loss in weight of lambs in R-1 fed sole SSBLR silage might be due to catabolism of body tissues to supply the much-needed nutrients for vital activities in the body and mis matching of energy and nitrogen in the rumen for microbial protein synthesis. Singh et al. (2011) reported feeding on residues of cereals like maize, millet and sorghum alone, resulted in the weight loss of the animals between 11 to 16%. This is because of the relatively low digestibility, low crude protein content and low content of available minerals and vitamins in the cereals residues. Similar negative average daily gain was reported by Koralangama et al. (2008) in sheep fed sole maize stover and ADG increased with supplementation of concentrate/cowpea to maize stover. Jadoon et al. (1990) observed negative ADG in ram lambs fed maize and oat silage alone and increased ADG observed with supplementation of concentrate to maize and oat silage.

To cite this paper: Vidya, B., Ramana Reddy, Y. and Srinivasa Rao, D. 2012. Effect of supplementation of concentrate to sweet sorghum (Sorghum bicolor L. Moench) bagasse leaf residue silage on performance and carcass characteristics in native sheep. *Online J. Anim. Feed Res.*, 2 (4): 332-339.
Scienceline/Journal homepages: http://www.science-line.com/index/; http://www.ojafr.ir

Table 3 - Effect of feeding SSBLR silage with different levels of concentrate on performance and cost economics in growing Nellore ram lambs

Parameter	Ration				
	R-1	R-2	R-3	R-4	SEM
Initial weight (kg)	14.05	14.05	14.00	14.00	0.35
Final weight (kg)**	11.91[c]	18.53[b]	20.20[ab]	21.53[a]	0.69
Weight gain (kg)**	-2.14[c]	4.48[b]	6.20[ab]	7.53[a]	1.59
Average body wt. (kg)**	12.98[b]	16.29[a]	17.1[a]	17.76[a]	0.49
Metabolic body wt. (kg)	6.81[b]	8.11[a]	8.41[a]	8.65[a]	0.18
Average daily gain (g)**	-17.91[c]	37.26[b]	51.70[ab]	62.76[a]	6.49
Feed intake					
Silage (kg/d)	1.12	1.12	1.07	1.13	0.03
Concentrate (g/d)	—	170[c]	225[b]	280[a]	0.00
DMI (g/d)**	351.17[c]	507.06[b]	536.88[ab]	606.90[a]	30.22
DMI (% b. wt.)	2.70	3.11	3.14	3.42	0.10
DMI (g/kg $w^{0.75}$)	51.34[b]	62.52[a]	63.84[a]	70.16[a]	2.42
Feed conversion ratio (DMI, kg/kg gain)*	-19.61[c]	13.61[a]	10.38[b]	9.67[b]	4.06
Feed cost (₹/kg)					
Silage	1.25	1.25	1.25	1.25	–
Concentrate	11.09	11.09	11.09	11.09	–
Economics Cost/ kg weight gain*(₹)	-77.98[c]	88.18[a]	74.18[b]	71.95[b]	12.24

Each value is the average of seven observations. [a,b,c] values bearing different superscripts in a row differ significantly *(P<0.05), **(P<0.01) 1 US $ = 54.8, wt.-weight

Sohail et al. (2010) and Jadoon et al. (1990) observed that the lambs fed maize silage and concentrate gained more daily gain than those fed sole maize silage. Maize, sorghum and other grass silages supplemented with different protein sources (such as fish meal, concentrate and addition of nitrogen sources) increased growth rate of growing animals (Kim et al., 2000). Petit and Castonguay (1994) observed that the ADG was lower (P<0.01) for lambs fed sole silage than those fed the silage plus concentrate, and it was increased with increase in the amount of concentrate being fed. Similar results were reported by Sartori et al. (2004) with sunflower silage in sheep and Chauhan and Gupta (1992) in buffalo calves with oat silage.

Dry matter intake

The total DMI (g/d) was significantly (P<0.01) higher in lambs fed R-4 ration, followed by those fed R-3, R-2 and R-1 rations (Table 3). The DMI (g/d) was increased by 44.39, 52.88, and 72.82, respectively when lambs fed R-2, R-3 and R-4 rations compared to R-1 ration. Present results indicated that total DMI was increased with supplementation of concentrate. Similar results were reported by Caplis et al. (2005) with grass silage supplemented with different levels of concentrate. Chauhan and Gupta (1992) reported that highest DMI in buffalo calves was observed in oat silage plus concentrate ration than those fed oat silage alone. However, Petit and Castonguay (1994) observed no significant difference in total DMI (g/d) among the steers fed silage and silage plus concentrate. In the present study there was no significant difference in total DMI when expressed as per cent body weight among the four dietary treatments. Further, the DMI (g/d or % b.wt.) from SSBLR silage was not influenced by the concentrate supplementation which was also reported by Kumar et al. (2010) in sheep fed SSBLR silage supplemented with concentrate. There was significant difference (P<0.05) in total DMI per unit of metabolic body weight between sole SSBLR silage and concentrate supplemented groups. Similar results were reported by Sartori et al. (2004) with sunflower silage or maize with increasing proportion of commercial concentrate. Whereas increased (P<0.05) DMI per unit of metabolic body weight with increasing concentrate proportion up to 43:57 concentrate: roughage ratio was reported by Bhuyan et al. (1996). Eifert et al. (2004) reported that there was linear increase in DMI (kg/d or g/kg $w^{0.75)}$ as the concentrate level increased to triticale silage.

Feed conversion ratio

Feed conversion ratio (DMI kg/kg gain) in Nellore growing ram lambs fed R-1, R-2, R-3 and R-4 rations ranged from -19.61 to 9.67 (Table 3). Negative FCR was recorded in lambs fed sole SSBLR silage and FCR was improved with supplementation of concentrate from R-2 to R-4 rations. Significant difference (P<0.05) was observed between R-2 and R-3, R-4 rations and there was no significant difference in FCR between the lambs fed R-3 and R-4 rations. The R-3 and R-4 rations were 23.73 and 28.94 per cent more efficient in FCR than those fed R-2 ration. Negative FCR in lambs fed R-1 ration is due to decrease in body weight during the experimental period. The growth rate was improved with increase in the proportion of concentrate in the diets and the FCR accordingly improved. Similarly Pereira et al. (2007) in beef cattle observed an improved FCR with supplementation of concentrate at different levels to sorghum (*Sorghum bicolor (L.) Moench*) silage Sohail et al. (2010) in sipli lambs reported higher feed efficiency when maize silage was supplemented with concentrate. Petit and Castonguay (1994) observed that the FCR was higher for lambs fed silage plus concentrate, and it increased with increase in the amount of concentrate being fed. Bhuyan et al. (1996) observed higher feed conversion efficiency as the

To cite this paper: Vidya, B., Ramana Reddy, Y. and Srinivasa Rao, D. 2012. Effect of supplementation of concentrate to sweet sorghum (Sorghum bicolor L. Moench) bagasse leaf residue silage on performance and carcass characteristics in native sheep. *Online J. Anim. Feed Res.*, 2 (4): 332-339.
Scienceline/Journal homepages: http://www.science-line.com/index/; http://www.ojafr.ir

concentrate proportion increased in the diet of kids. Similar results were reported by Sartori et al. (2004) with sunflower silage or maize with increasing proportion of commercial concentrate in the ration.

Economics

The cost of feed/kg gain (₹) in lambs fed R-1, R-2, R-3 and R-4 rations was -77.98, 88.18, 74.18 and 71.95, respectively (Table 3). Among the concentrate supplemented groups cost (₹)/kg live weight gain was significantly (P<0.01) highest in ram lambs fed ration R-2 followed by R-3 and R-4 rations and negative cost (₹)/kg live weight gain was recorded in Nellore ram lambs fed sole SSBLR silage which was due to loss of body weight during the experimental period. The cost (₹)/kg live weight gain was lower by 18.40 and 3.00 per cent in ram lambs fed R-IV ration than those fed R-2 and R-3 rations, respectively. The reason for highest cost (Rs.)/kg live weight gain in lambs fed R-2 ration than those fed the other supplemental experimental rations could be due to low level of supplementation with concentrate to the ram lambs.

The total cost of feed amounts to the extent of 60-80 per cent in livestock farms (Reddy et al., 2009) and the average value of feed cost (70%) is accepted under Indian conditions (Hegde, 2006). Increased profitability of lamb production is dependent on reducing input costs and/or increasing production output. Any reduction in feed intake or increase in feed efficiency without compromising on growth rate or carcass quality can have a significant positive impact on lamb production (Snowder and Van Vleck, 2003). In the present study, the results shown that supplementation of 280 g concentrate to SSB silage is consider to be economical in growing ram lambs.

Carcass and Meat Characteristics

Live Weight and Carcass Weight: The live body weight, empty body weight and carcass weight was significantly (P<0.01) lower in lambs fed sole SSBLR silage than those supplemented with concentrate (Table 4). Among the concentrate supplemented groups the values were significantly (P<0.01) lower in lambs fed R-2 ration compared to those fed R-3 and R-4 rations. Prasad et al. (1981) reported higher hot carcass weight in native and cross bred lambs fed higher proportion of concentrate. Caplis et al. (2005) reported that the carcass weight was significantly increased with increasing level of concentrate to grass silage. Petit and Castonguay (1994) reported higher carcass weight in cross bred lambs fed higher proportion of concentrate.

Dressing Percentage: The mean dressing percentage on slaughter weight and empty body weight ranged from 39.15 to 49.01 and 51.36 to 59.17 in lambs fed R-1, R-2, R-3 and R-4 rations, respectively (Table 4). Significantly (P<0.01) higher dressing percentage was recorded in lambs fed R-IV ration on any basis. Petit and Castonguay (1994) reported high levels of concentrate supplementation increased dressing percentage. Similar results reported by Chestnutt (1992) and Povey et al. (1990) who observed that inclusion of concentrate increased dressing percentage, final live weight, and carcass weight of lambs fed silage. Jabbar and Anjum (2008) reported that high concentrate in the diet also improved dressing percentage in lambs. Papi et al. (2011) stated that the dressing percentage increased linearly with increasing level of concentrate in the diet.

Contrary to the present study, Bhuyan et al. (1996) reported insignificant dressing percentage improvement with various proportions of concentrate to roughage. Similar results were reported by Dien et al. (1990) with increased proportion of concentrate to roughage in buffalo calves.

Table 4 - Effect of feeding SSBLR silage with different levels of concentrate on carcass characteristics in growing Nellore ram lambs

Parameter	Ration				
	R-1	R-2	R-3	R-4	SEM
Pre slaughter wt. (kg)	13.06^{c}	18.06^{b}	20.26^{a}	20.26^{a}	0.90
Empty body wt. (kg)	9.96^{c}	14.33^{b}	16.94^{a}	16.78^{a}	0.86
Carcass wt. (kg)	5.13^{c}	7.63^{b}	9.13^{a}	9.93^{a}	0.56
Dressing %					
On slaughter wt.	39.15^{c}	42.24^{bc}	45.05^{b}	49.01^{a}	1.19
On empty body wt.	51.36^{b}	53.27^{b}	53.88^{b}	59.17^{a}	1.04

Each value is the average of five observations

Proportion of Wholesale Cuts: Supplementation of concentrate to SSBLR silage at different levels did not significantly influence the per cent wholesale cuts of the lambs. Similar results were reported by Bhuyan et al. (1996) and Dien et al. (1990). There was significant (P<0.05) difference in edible, non edible portion and ratio of edible and non edible portions of lambs fed sole SSB silage and concentrate supplemented group. Contrary to the findings of the present study Bhuyan et al. (1996) reported non significant difference in edible and non edible portions. Neck, shoulder, rack–loin, and leg weights were not affected by concentrate level (Papi et al., 2011).

Yield of Visceral Organs: Supplementation of concentrate to SSBLR silage did not affect the yield of pluck, liver, heart, testes, GIT, spleen, lungs with trachea as percentage of pre-slaughter weight (Table 6). The results of the present study were in accordance with the findings of Dien et al. (1990). Skin, head, kidney, lung and spleen weights were not affected by concentrate level in the diet (Papi et al., 2011).

To cite this paper: Vidya, B., Ramana Reddy, Y. and Srinivasa Rao, D. 2012. Effect of supplementation of concentrate to sweet sorghum (Sorghum bicolor L. Moench) bagasse leaf residue silage on performance and carcass characteristics in native sheep. *Online J. Anim. Feed Res.*, 2 (4): 332-339.
Scienceline/Journal homepages: http://www.science-line.com/index/; http://www.ojafr.ir

Table 5 - Effect of feeding SSBLR silage with different levels of concentrate on yield of whole sale cuts and edible, non edible portions (% carcass weight) in growing Nellore ram lambs					
Parameter	Ration				
	R-1	R-2	R-3	R-4	SEM
Fore shank	17.24	15.44	16.68	16.90	0.50
Neck and shoulder	26.63	26.83	25.44	25.58	0.77
Rack	12.45	10.58	12.02	11.27	0.53
Loin	12.61	11.84	11.91	11.17	0.42
Leg	31.04	35.28	33.93	35.07	0.99
Edible portion (% slaughter wt.)	53.09[b]	55.14[ab]	57.83[a]	58.88[a]	0.86
Non edible portion (% slaughter wt.)	22.04	19.04[b]	18.33[b]	19.16[b]	0.54
Non edible : edible portions	2.41[b]	2.91	3.15[a]	3.08[a]	0.10
Each value is the average of five observations					

Table 6 - Effect of feeding SSBLR silage supplemented with concentrate at different levels on yield of visceral organs (% pre slaughter weight) in Nellore growing ram lambs					
Parameter	Ration				
	R-1	R-2	R-3	R-4	SEM
Pluck	4.05	3.98	3.64	3.63	0.07
Liver	1.58	1.78	1.81	1.73	0.06
Kidney	0.30	0.27	0.26	0.29	0.01
Heart	0.48	0.49	0.47	0.45	0.02
Testes	0.44	0.45	0.57	0.58	0.05
GIT full	31.62	27.86	30.34	26.68	0.88
GIT empty	7.83	7.79	7.96	7.51	0.16
Spleen	0.46	0.43	0.40	0.35	0.02
Lungs with trachea	1.98	1.70	1.35	1.45	0.10
Skin (kg)	2.05	2.06	2.08	2.09	0.15
Head (kg)	1.28	1.32	1.34	1.36	0.12
Blood (kg)	0.46	0.47	0.49	0.51	0.07
Each value is the average of five observations. P>0.05					

Proportion of Meat, Bone and Fat in Carcass: No significant variation could be seen in bone and meat yield (%) and their ratios in various wholesale cuts among dietary treatments (Table 7). Fat percentage numerically increased from R-1 to R-4 rations. Reddy and Raghavan (1987) found no significant change in lean, bone and fat proportions with increasing concentrate level in the diet. Papi et al. (2011) indicated that lean and bone weights were not affected by the different levels of concentrate whereas subcutaneous and total fat weights were least for lambs fed the diet containing 30% of concentrate and greatest for lambs fed the diet containing 50% of concentrate.

Table 7 - Per cent yield and ratio of bone and meat in whole carcass in Nellore ram lambs fed SSBLR silage supplemented with concentrate at different levels					
Parameter	Ration				
	R-1	R-2	R-3	R-4	SEM
Carcass wt. (kg)	5.13[c]	7.63[b]	9.13[a]	9.93[a]	0.56
Meat	53.75	51.80	51.72	51.32	0.38
Bone	38.91	39.85	39.17	38.89	0.27
Fat	7.36	8.35	9.12	9.81	0.29
B-M ratio	1.38	1.30	1.32	1.32	0.01
Each value is the average of five observations.					

Contrary to the present findings, Caplis et al. (2005) observed increasing trend in fat percentage and decreased bone proportion with increased concentrate level. Bhuyan et al. (1996) observed significant increase in the percentage of dissectible fat with increased proportion of concentrate in the diet. Dien et al. (1990) reported a significant increase in the percentage of omental and pelvic fat with increasing concentrate level.

Chemical Composition of Meat: The chemical composition of *Longissimus dorsi* muscle is collected from the carcasses of ram lambs fed different experimental rations revealed that the moisture, protein, and ash content of muscle were ranged from 74.5 to 75.0, 21.6 to 21.7 and 1.9 to 2.4, respectively (Table 8).

Supplementation of concentrate to SSB silage did not affect the chemical composition of meat. Bhuyan et al. (1996) and Dien et al. (1990) observed no variation in the chemical composition of meat with increasing concentrate level in the diet.

To cite this paper: Vidya, B., Ramana Reddy, Y. and Srinivasa Rao, D. 2012. Effect of supplementation of concentrate to sweet sorghum (Sorghum bicolor L. Moench) bagasse leaf residue silage on performance and carcass characteristics in native sheep. *Online J. Anim. Feed Res.*, 2 (4): 332-339.
Scienceline/Journal homepages: http://www.science-line.com/index/; http://www.ojafr.ir

Table 8 - Chemical composition of *Longismus dorsi* muscle on fresh basis (%) in Nellore growing ram lambs fed SSBLR silage supplemented with concentrate at different levels					
Parameter	Ration				
	R-1	R-2	R-3	R-4	SEM
Moisture	74.96	74.81	74.68	74.41	0.11
Protein	21.64	21.65	21.71	21.73	0.04
Fat	1.45	1.46	1.48	1.49	0.01
Ash	1.94	2.09	2.13	2.38	0.07

Each value is the average of five observations

CONCLUSIONS

SSB silage on sole ration could not meet the nutrient requirements indicating that the supplementation with energy and protein rich feeds was necessary. Concentrate can be included at 280 g to SSB silage to obtain optimum growth rate, feed efficiency and meat quality in growing Nellore ram lambs.

ACKNOWLEDGEMENT

The authors wish to acknowledge the financial assistance received from World Bank through Indian Council of Agricultural Research, New Delhi, India under the National Agricultural Innovation Project for carrying out the present work. Authors also place on records acknowledgments to ICRISAT, Patancheru, and Sri Venkateswara Veterinary University for providing all the facilities to carry out this research work.

REFERENCES

Abdul SB, Yashim SM and Jokthan GE (2008). Effects of Supplementing Sorghum Stover with Poultry Litter on Performance of Wadara Cattle. American-Eurasian Journal of Agronomy, 1(1):16-18.

AOAC (1997). Association of Official Analytical Chemists, Official Methods of Analysis. 16th edition, Washington D C.

Bhuyan R, Baruah K K and Das P C 1996 Growth response and carcass characteristics of crossbred kids fed rations having different concentrate to roughage ratios. Indian Journal of Animal Nutrition, 13 (3):167-169.

Blummel M, Rao SS, Palaniswamy S, Shah L and Belum Reddy VS (2009). Evaluation of Sweet Sorghum (*Sorghum bicolor L.Moench*) used for Bio ethanol production in the context of optimizing whole plant utilization. Animal Nutrition and Feed Technology, 9: 1-10.

Caplis J, Keane MG, Moloney AP and O'Mara FP (2005). Effects of supplementary concentrate level with grass silage, and separate or total mixed ration feeding, on performance and carcass traits of finishing steers. Irish Journal of Agricultural and Food Research, 44: 27-43.

Chauhan TR and Gupta R (1992). Effect of feeding conventional and non-conventional concentrate mixtures with Oat silage on nutrient utilization in growing buffalo calves. Indian Journal of Animal Nutrition, 9(4): 219-223.

Chestnutt DMB. (1992). Supplementation of silage-based diets for finishing lambs. Anim. Prod., 55:137.

Dien DL, Pathak NN and Sharma MC (1990). Response and carcass characteristics of male Murrah buffalo calves fed rations with different concentrate to roughage ratio. Indian Journal of Animal Nutrition, 7(4):287-290.

Duncan DB (1955). Multiple range and multiple F tests. Biometrics, 11, 1-42.

Eifert E da C, Restle J, Pascoal LL, Brondani IL, Neumann M, Silva JHS da and Carlotto SB. (2004). Performance of beef calves weaned at 88 days old, fed triticale silage and different concentrate levels. Revista Brasileira de Zootecnia, 33(6): 1806-1813.

FAO (2010). http://faostat3.fao.org/home/index.html#DOWNLOAD. Food and Agriculture Organization, Rome, Italy.

Hegde (2006). Livestock development for sustainable livelihood of small farmers. 48th National symposium on 'Energizing Rual India, August 26, Maneswar, Harayana. pp. 5-63.

ISI (1963) Indian standard specifications for mutton and goat flesh: fresh, chilled and frozen (IS 2536), Bureau of Indian Standards, New Delhi

Jabbar and Anjum MI (2008). Effect of diets with different forage to concentrate ratio for fattening of Lohi lambs. Pakistan Veterinary Journal, 28: 150-152.

Jadoon JK, Syed AH, Mirza IH and Naqvi MA (1990) Feedlot fattening of sheep in Pakistan. Asian Australasian Journal of Animal Science, 3:161–164.

Kim SC, Kim JH, Kim CH, Lee JC and Ko YD (2000). Effects of whole crop corn ensiled with cage layer manure on nutritional quality and microbial protein synthesis in sheep. Asian Australasian Journal of Animal Science, 13:1548–1553.

Koralagama KDN, Mould FL, Fernandez-Rivera S and Hanson J (2008). The effect of supplementing maize stover with cowpea (*Vigna unguiculata*) haulms on the intake and growth performance of Ethiopian sheep. Animal, 2(6): 954–961.

Kumar AA, Reddy BVS, Blummel M, Anandan S, Ramana Reddy Y, Ravinder Reddy Ch, Srinivasa Rao, P, Sanjana Reddy P and Ramaiah B. (2010). On-farm evaluation of elite sweet sorghum genotypes for grain and stover yields and fodder quality. Animal Nutrition and Feed Technology, 10S: 69-78.

Lopez-Guisa J M, Satter L D and Panciera M 1991 Utilization of ensiled corn crop residues by Holistein heifers. Journal of Dairy Science, 74: 3160-3166.

Papi N, Mostafa-Tehrani A, Amanlou H and Memarian M. (2011). Effects of dietary forage-to-concentrate ratios on performance and carcass characteristics of growing fat-tailed lambs. Animal Feed Science and Technology, 163: 93–98

Pereira DH, Pereira OG, Bruno CS, Maria IL, Sebastião de CVF, Fernanda HMC and Rasmo G (2007). Intake and total and partial digestibility of nutrients, ruminal pH and ammonia concentration and microbial efficiency in beef cattle fed with diets containing sorghum (Sorghum bicolor (L.) Moench) silage and concentrate in different ratios. Livestock Science, 107 (1): 53-61.

Petit HV and Castonguay F (1994). Growth and carcass quality of prolific crossbred lambs fed silage with fish meal or different amounts of concentrate. Journal of Animal Science, 72:1849-1856.

Povey GM, Webster GM and Weekes TEC. (1990). The response of silage fed Scottish Blackface lambs to increasing level of fish meal supplementation with or without additional barley. In: C.F.R. Slade and T.J.L. Lawrence (Ed.) New Developments in Sheep Production. Occ. Publ. Br. SOC. h i m . Prod. No. 14. pp 157-161. Edinburg, U.K.

Prasad VSS, Singh RA and Bapana DL (1981). Carcass composition of native and crossbred lambs maintained on two different rations. Indian Journal of Animal Genetics and Breeding, 3: 25-30.

Rao SS, Seetharama N, Dayakar Rao B, Rathnavathi CV and Reddy ChS (2008). Sweet sorghum-A potential energy crop for bio fuel production in India. In: sorghum improvement in the new millennium (Eds. BVS Reddy, S Ramesh, A Ashok Kumar and CLL Gowda.) ICRISAT, Patancheru, A.P, India. pp. 340.

Reddy BVS, Ramesh S, Sanjana Reddy P, Ramaiah B, Salimath PM and Rajasekhar Kachapur (2005). Sweet Sorghum-A Potential Alternative Raw Material for Bio ethanol and Bio energy. International Sorghum and Millets Newsletter, 46: 79-86.

Reddy YR, Sarjan KR, Sudhakar K, Gupta BR and Prakash MG (2009). Evaluation of Azolla and sheanut based diets on growth performance and nutrient utilization in Nellore weaners under different management systems. Indian Journal of Animal Nutrition, 26(1):46-50.

Reddy TJ and Raghavan GV 1987 Effect of plane of nutrition on carcass characteristics of desi goats. Indian Veterinary Journal, 64: 866-868.

Sartori IBM, Evaldo Ferrari Junior I, Rosana Aparecida Possenti I, DiorandeBianchini II, Fontoura Leinz Frederick II and Carlos Frederico de Carvalho Rodrigues II (2004) Performance of lambs fed sunflower silage or maize with increasing proportions of concentrate. R. Bras. Zootec, 33 (6).

Singh BB, Musa A, Ajeigbe HA and Tarawali SA (2011). Effect of feeding crop residues of different cereals and legumes on weight gain of Yankassa rams. International Journal of Livestock Production, 2 (2): 17-23.

Snedecor GW and Cochran WG (1994). Statistical methods. 8th edition, Iowa State University Press, Ames, Iowa, USA-50010.

Snowder GD and Van Vleck LD (2003). Estimate the genetic parameters and selection strategies to improve the economic efficiency of post weaning growth in lambs. Journal of Animal Science, 81:2704-2713.

Sohail HK, Muhammad AS, Maher N and Muhammad S (2010). Nutrients intake, digestibility, nitrogen balance and growth performance of sheep fed different silages with or without concentrate. Tropical Animal Health and Production. DOI 10.1007/s11250-010-9765-1.

Sudesh Radotra and Upadhyay VS (2005). Effect of ensiled sorghum stovers on the performance of lactating cows. Indian Journal of Animal Nutrition 22 (2): 135-137.

Van Soest J, Robertson JB and Lewis BA (1991). Methods for dietary fiber, neutral detergent fiber and non starch polysaccharides in relation to animal nutrition. Journal Dairy Science 74: 3583-3597.

To cite this paper: Vidya, B., Ramana Reddy, Y. and Srinivasa Rao, D. 2012. Effect of supplementation of concentrate to sweet sorghum (Sorghum bicolor L. Moench) bagasse leaf residue silage on performance and carcass characteristics in native sheep. *Online J. Anim. Feed Res.*, 2 (4): 332-339.
Scienceline/Journal homepages: http://www.science-line.com/index/; http://www.ojafr.ir