Evaluation of Sugarcane Bagasse Treated by Urea as Energy Source(Iso-coloric and Iso –nutrogenic) in Total mix Ration

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To address problems associated with poverty and food shortage, scientists investigated alternative food sources, evaluated present land use and utilization of food, thus feeding grains to ruminants is questioned because man and monogastric can utilize grains directly. On the other hand ruminants are characterized by their ability to convert low quality roughage to high nutritive products, which are useful to man e.g (meat, milk, natural fibers, leather and manure) (Gerfenbach and Dugmore., 2004).

Agricultural by-products such as bagasse have enough potential to be used as non conventional roughage for animal feed in Sudan, particularly when forages are in short supply. Bagasse is the main byproduct of sugarcane industry; it contains 60 to 70% carbohydrate, mostly in the form of polysaccharides and is a potential source of dietary energy for animals. The major limitation of bagasse as feed is its low digestibility which is due to association of lignin with cellulose and hemicelluloses (Atta Elmnan et al., 2009).

To improve the nutritive value of these agriculture residues, it is important to breakdown the linkages among cellulose and lignin by mechanical, chemical or biological and combined biological plus chemical treatments. Many scientists suggested the use of ammonia and urea to increase the crude protein contents of the poor quality roughages (Shoukry et al., 1992 & Fouad et al., 1998 Atta Elmnan et al., 2007, 2009). However, chemically and physically treated crop residues and other poor quality forages have been investigated extensively throughout the last years; there have been limited research studied the inclusion of these treated materials in total mix ration (TMR) in Sudan.

The aim of the present study was to investigate the possibility of replacing sorghum grains by 10%, 20% and 30% of treated baggasse, which represent 2.6%, 5.2% and 7.8% respectively of total ration component. The specific objectives are to determine the effect of inclusion different levels of treated bagasse instead of sorghum grains on in-vitro dry matter digestibility and dry matter degradability.

MATERIALS AND METHODS

Experimental site:

The experiment was conducted at the Laboratory of Department of Animal Nutrition, Faculty of Animal Production, - University of Khartoum, Sudan.

Feeds preparation:

Four iso-caloric and iso-nitrogenous rations were formulated Table (1) to meet the daily nutrient requirement of goat according to NRC (1985). Table (3.2) showed the ingredients of the different rations which can be namely as follow:

- (A)Contained 0% of treated sugarcane bagasse.
- (B)Contained 2.6% of treated sugarcane bagasse which replaced 10% of sorghum grains.
- (C) Contained 5.2% of treated sugarcane bagasse which replaced 20% of sorghum grains.
- (D)Contained 7.8% of treated sugarcane bagasse which replaced 30% of sorghum grains.

Chemical Analysis:

- Samples of feed examined and residues were analyzed for their proximate components, dry matter (DM), ash, ether extract (EE), crude protein (CP), crude fiber (CF) according to AOAC (1990). While nitrogen free extract (NFE) calculating using the following equation:
- NFE% = DM – (CP% + EE% + ash% + CF %).

In- vitro Dry Matter digestibility:

- In vitro dry matter digestibility (IVDMD) was conducted using the procedure demonstrated by Tilley and Terry (1963)

In situ dry matter degradability:

Degradability study of different parts of sugarcane bagasse (SCB) carried out in the rumen of tow fistulated adult crossbred cattle (250-300kg) according to the nylon bag technique described by Ørskov et al., (1980). The fistulated animal was fed at maintenance level on a balanced roughage concentrate diet with free access to water and mineral blocks The dry matter of each sample was incubated for 4 , 8 , 16 , 24 , 48 , 72 and 96 hrs.

Statistical analysis:

Data obtained from experiment were subjected to analysis of variance (ANOVA) according to completely randomize design. Where the F test was significant, Means between treatments were compared using the least significant difference (LSD).

Table (1) : Calculated Chemical Analysis of Experimental Rations

Items	CP (%)	ME(MJ/KgDM)
A	12.92	10.43
B	12.86	10.08
C	12.92	9.81
D	12.57	9.59

A: 0% of treated bagasse , B: contained 2.6% treated sugarcane bagasse which replaced 10% of sorghum grains, C: contained 5.2% treated sugarcane bagasse which replaced 20% of sorghum grains and D : contained 7.8% treated sugarcane bagasse which replaced 30% of sorghum grains.

Table (2): Ingredients (%) of the experimental diets

	A	B	C	D
Sorghum	26	23.4	20.8	18.2
Treated bagasse	0	2.6	5.2	7.8
Molasses	33	35	32	30
Groundnut Cake	6	8	8	7
Wheat bran	34	30	33	36
Salt	0.5	0.5	0.5	0.5
Lime stone	0.5	0.5	0.5	0.5
Total	100	100	100	100

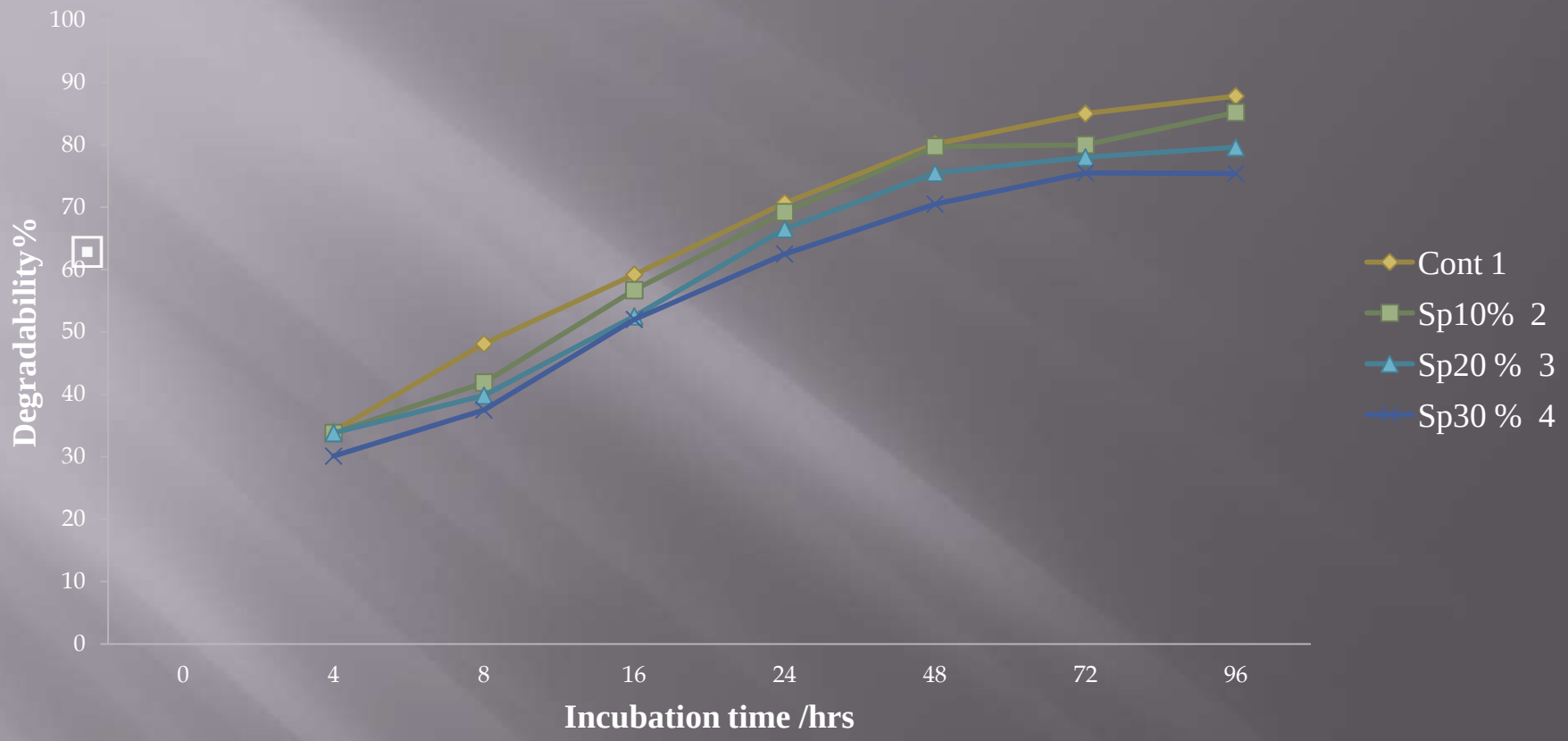
A: 0% of treated bagasse , B: contained 2.6% treated sugar cane bagasse which replaced 10% of sorghum grains, C: contained 5.2% treated sugar cane bagasse which replaced 20% of sorghum grains and D : contained 7.8% treated sugar cane bagasse which replaced 30% of sorghum grains.

RESULTS

Table (3): In vitro Dry Matter Digestibility (%) of Tested rations

Treatments	IVDMD
A	0.8850^{a}
B	0.8400^{b}
C	0.7800^{c}
D	0.7450^{d}
SEM	0.0139
S.L	**

A: 0% of treated bagasse , B: contained 2.6% treated sugar cane bagasse which replaced 10% of sorghum grains, C: contained 5.2% treated sugar cane bagasse which replaced 20% of sorghum grains and D : contained 7.8% treated sugar cane bagasse which replaced 30% of sorghum grains. SEM standard error of means: a-d means with different superscripts in the same column were significantly different ($P< 0.05$).



- **Fig. 1: Rumen degradation of DM% of tested different rations**

Table (4): Kinetics degradability of tested rations

Term	A	b	C	ED 0.02	ED 0.05	ED 0.08	PD
A	23.00[a]	63.64[a]	0.056[a]	69.8[a]	56.5[a]	49.1[a]	86.7[a]
B	20.16[b]	63.54[a]	0.056[a]	67.1[b]	53.9[b]	46.5[b]	83.7[b]
C	20.38[b]	59.59[b]	0.054[a]	63.9[c]	51.5[c]	44.6[c]	80[c]
D	17.83[c]	58.12[b]	0.056[a]	60.8[d]	48.8[d]	42.1[d]	75.7[d]
SEM	0.36	0.40	0.06	0.050	0.050	0.043	0.044

a: Readily degradable fraction; b: slow degradable fraction; a+b: Potential degradability; c: Rate of degradability; ED: Effective degradation at three levels of rumen out flow rate; A: 0% of treated bagasse , B: contained 2.6% treated sugarcane bagasse which replaced 10% of sorghum grains, C: contained 5.2% treated sugarcane bagasse which replaced 20% of sorghum grains and D : contained 7.8% treated sugarcane bagasse which replaced 30% of sorghum grains, SEM standard error of the mean: a-c means with different superscripts in the same column were significantly different (P0.05).

Table 4: Appendix (1): Dry matter disappearance of tested rations

	0	4	8	16	24	48	72	96
A	15.158 [a]	34.184[a]	48.164[a]	59.617[a]	70.725[a]	80.117[a]	85.171[a]	87.952[a]
B	14.783[ab]	33.869[a]	42.061[b]	56.664[b]	69.228[b]	79.719[a]	80.028[b]	85.167[b]
C	13.719[b]	33.341[a]	39.837[c]	52.529[c]	66.643[c]	75.583[b]	78.001[c]	79.715[c]
D	12.296[c]	30.466[b]	37.358[d]	52.010[d]	62.495[d]	70.729[c]	75.594[d]	75.594[d]

A: 0% of treated bagasse , B: contained 2.6% treated sugar cane bagasse which replaced 10% of sorghum grains, C: contained 5.2% treated sugar cane bagasse which replaced 20% of sorghum grains and D : contained 7.8% treated sugar cane bagasse which replaced 30% of sorghum grains. (SEM) standard error of means: a-d means with different superscripts in the same column were significantly different ($P < 0.05$).

CONCLUSION AND RECOMMENDATION

- **From the present study it could be concluded that:**

  * The highest DM digestibility and degradability obtained by the control ration which contained 0% of treated bagasse.

  * Decreased in DM digestibility and degradability associated with the increasing level of treated bagasse in total mix ration .

  *The values of DM digestibility and degradability of tested rations are within the range of moderate to high level of digestibility.

- **The following recommendations are suggested:**

  * Readily energy source must be added to treated bagasse in total mix ration to enhance ME content of treated bagasse which may improve digestibility.

  * More study is needed to evaluate the treated sugarcane bagasse in total mix ratio in vivo feeding trial.

  * Further researches are needed to approve the economic appraisal of replacing sorghum grains by treated agricultural by-product in TMR.

THANKS