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FEED INTAKE AND DIGESTIBILITY COEFFICIENTS OF SUGAR CANE BAGASSE AS AFFECTED BY DIFFERENT CHEMICAL TREATMENTS

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SUMMARY

Chopped sugar cane bagasse (S.C.B.) of 5-10 cm. length underwent different alkali or acid treatments to improve it's nutritive value. Two experiments were conducted in this study. In experiment 1, four mature Ossimi rams were fed untreated SCB, 5% NAOH, 2.5% NAOH +2.5% $Ca(OH)_2$ and 6% NH_3 treated SCB, in a 4×4 latin square arrangement. The SCB represented 75% of the ration while the rest (25%) was the conventional concentrate mixture. This experiment was set-up in summer and repeated in winter season with an additional treatment using diluted H_2SO_4 (2.4% of dried SCB). A 5×5 latin square design was applied in the winter experiment. In experiment 2, a mixture of molasses and urea that represent 15 and 3% of the diet were added to replace the concentrate mixture. Intake from dry matter (IDM), organic matter (IOM) and intake from digestible organic matter (IDOM) were recorded beside the nutrients digestibility coefficients of the bagasse based rations. NH_3 treatment increased the crude protein (CP) content from 2.82 to 8.31%. Both NDF, ADF contents were significantly decreased by 7.95, 3.01 and 8.76% for NDF of the control and 4.25, 3.30 and 7.30% for ADF of the control according to NaOH, NaOH + $Ca(OH)_2$ and H_2SO_4 treatments respectively. The IDM, IOM and IDOM g/kgw$^{0.75}$ were significantly ($p<0.01$) increased by alkali treatments, while acid treatment had no effect in this regard. IDM, IOM and IDOM g/kgw$^{0.75}$ were significantly ($P<0.01$) increased during winter time 704.11, 637.06 and 25.21 g/kgw$^{0.75}$/day vs. 460.18, 417.67 g/day 17.10 g/kgw$^{0.75}$/day respectively. The digestibility coefficients of organic matter (OMDC), neutral detergent fiber (NDFDC), acid detergent fiber (ADFDC), hemicellulose (HDC) and cellulose (CDC) were significantly improved by alkali treatment. Addition of molasses 15% of the bagasse can successfully replace the conventional concentrate mixture when urea was added to balance the N content of the different treatments. The data of feed intake and digestibility of these diets were investigated. Such chemical treatment improved the feeding value of SCB. Molasses (15%) and urea (3%) addition can replace the conventional concentrate mixture in the ration of mature sheep.

Keywords: Sheep, sugar cane bagasse, chemical treatments, feed intake,digestibility

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INTRODUCTION

Sugar cane bagasse (SCB) is a secondary by-product of sugar cane extracting factories. It is used for making pressed fibrous wood, paper pulp and as fuel. Bagasse represents 30-32% of the sugar cane plant (Barnes, 1974). The annual production of SCB in Egypt is in the order of one million metric ton (El-Shinnawy, 1990).

Bagasse can be used as an alternative feed for ruminants to fill partially the gap in the availabe feed nutrients. It has a poor nutritive value, 48% TDN, 1.74 MCaL metabolisable energy/Kg dry matter (NRC, 1984).

The poor quality roughages can undergo different treatmenrs (physical, microbiological or chemical) and/or supplemented with appropriate supplements (energy, protein, minerals and/or vitamins) to enrich its feeding value (Sundstol and Coxworth, 1984; Fahmy *et al.*, 1984 and Fahmy and Klopfedstein, 1992 and 1994).

In this work, SCB was treated with different alkali (NAOH, NAOH + $Ca(OH)_2$ or NH_4OH) or acid (H_2SO_4) reagent to find the most effective treatment on digestion and intake of digestible nutrients. On the other hand, molasses (energy source) and urea (NPN source) were added as supplements to SCB in order to fortify its feeding value and to replace the conventional concentrate mixture used in the traditional rations.

MATERIALS AND METHODS

Two experiments were conducted to evaluate SCB as roughage source in ruminants ration. Experiment 1 was repeated twice, Trial a) was done in Summer season. Four rams were fed on four treatments of SCB in 4×4 latin square design. The treatments were: 1-Untreated SCB, 2-NAOH treared SCB, 3-NAOH + $Ca(OH)_2$ treated SCB, 4-NH_4OH) treated SCB (6% NH_3 on dry matter basis). Trial b) was done in winter season. Five rams were fed five treatments of SCB. The treatments were those mentioned above and the fifth was H_2SO_4 treated SCB.

The treated or untreated SCB represented 75% of the ration, while the rest 25% was conventional concentrate mixture. The animals were fed *ad libitum* on the tested rations for 22 days (15 days for adaptation followed by 7 days of total fecal collection in metabolic cages) there after they were shifted to feed the other treated SCB for the same period and so on. Water was available freely in front of the animal along the experiment. Feeds were offered at 8.30 a.m daily where the residues were withdrawn, dried, weighed and kept for analysis. At the same time faeces were totally collected, weighed and 10% homogeneous sub sample was taken for each animal, dried on 60^oC for 24h. and kept in tightly closed jars. At the end of each collection period 7 fecal samples for each animal were pooled, ground and stored for laboratory analysis in air tight jars.

Experiment 2 was done using four adult rams fed four SCB diets treated as those mentioned in trial a) and supplemented with molasses that represented 15% of the ration. Urea was added to adjust the N level of the different treatments up to the level of NH_4OH treatment. The animals were fed *ad libitum* as mentioned in experiment 1. The same fecal collection procedure was followed as experiment 1. Urine was collected daily for each animal where its volume was measured and the pH value was recorded.

Animals : Adult ossimi rams of 10-12 months old and of 35-40 kg body weight were used in this study. They were housed in metabolic cages throughout the collection period.

Treatment Procedures:

[1] *5% NaOH treatment*: Chopped bagasse (5-10 cm. length) was dipped in 0.5% NaOH solution (1:10 w/w) for one hour. Thereafter it was lifted up for half an hour for dripping, then spead in a thin layer for solar drying and self neutralization. The remaining NaOH solution was reused after a new solution was added to replace the absorbed portion.

[2] *2.5% NaOH plus 2.5% ca(OH)$_2$ treatment*: The same as the above treatment, but the concentration of each NaOH and $Ca(OH)_2$ was 0.25% in the solution.

[3] *6% NH_3 treatment:* Chopped bagasse was put in plastic sacs, NH_4OH solution was applied in amounts to provide 6% NH_3 on dry matter basis. The moisture content of the bagasse was adjusted to be 40% by addition of water. Sacs were closed tightly and allowed to react for two weeks, after which they were opened and the bagasse was aireated. Two weeks later treated SCB were available to be fed.

[4] *2.4% N_2SO_4 treatment:* Bagasse was sprinkled with diluted H_2SO_4 solution in amounts to provide 2.4 g H_2SO_4/100 g dried SCB. The moisture content of the treated bagasse was matched to 40% level. After 15 days of ensiling the bagasse was spread in a thin layer and left for solar drying.

Chemical analysis:

Analysis of feeds and faeces for moisture, ash crude protein and ether extract and N in urine were carried out according to A.O.A.C., 1980. Neutral detergent fiber (NDF), acid detergent fiber (ADF) and acid detergent lignin (ADL) were detemined in feeds and faeces according to Goering and Van soest, 1970.

Statistical analysis:

The data were analysed using the general linear model of the Statistical Analysis System (SAS, 1982). Duncan's multiple range test was applied to identify the significant differences between means.

RESULTS

1 Chemical composition of experimental diets:

Treatment with NH_4OH significantly increased ($p< 0.01$) the CP content of SCB. This increase was 5.49% percentage units. It was raised from 2.82 to 8.31% in the untreated SCB and NH_3-SCB respectively. A significant reduction in ether extract (EE) content of SCB was observed as it was treated by any of the chemical reagents used (Table 1). Treatments with NaOH, NaOH + Ca $(OH)_2$ and H_2SO_4 significantly decreased the NDF content of SCB from 78.07 to 71.83, 75.68% and 71.18% respectively, while thisfigure for NH_4OH-SCB was 78.22%. ADF content of SCB followed the same trend as NDF. It was decreased significantly from 68.12 to 65.04,

Table 1. The proximate analysis of concentrate feed mixture and sugar cane bagasse (S.C.B) untreated or treated with different chemical reagents (% drymatter basis).

Feeds	Constituent							
	Crude protein	Ether extract	NDF	ADF	ADL	Hemicelli-ulose	Cellulose	ASH
Concentrate Mix.	13.82	3.50	43.72	18.94	6.25	24.45	13.03	12.18
±SE	± 0.61B	± 0.21B	± 0.15B	± 0.29	± 0.13	± 0.36	± 0.37	± 0.13
Untreated SCB								
5% NaOH	2.82A	.03ABCa	78.07ABa	68.12	13.91a	9.96a	54.20Aa	3.74ABCD
2.5% NaOH	3.41B	0.69A	71.83ACD	65.04	13.10d	6.79b	51.94BCa	11.06AEF
2.5% CaOH	3.25C	0.66B	75.68CEab	65.87	12.70abc	9.80c	53.20Db	11.23BGH
6% NH_3	8.31ABCD	0.84Da	78.22DbF	69.27	13.99b	8.92d	55.31BEb	5.39CEG
2.4% HSO	2.73D	0.53CD	71.18BEF	63.15	13.85c	8.04e	49.30ACDE	5.73DFH
Mean SE	0.24	0.05	0.57	0.46	0.26	0.98	0.52	0.26

Means within column having similar subscripts differ significantly (small letters, $P<0.05$; capital letters, $P<0.01$).

63.04, 65.87 and 63.15% as it was treated with NaOH, NaOH + Ca $(OH)_2$ and H_2SO_4 respectively but it was 69.27% for NH_4OH-SCB. The most effective treatment in reducing ADL content of SCB was NaOH + Ca $(OH)_2$ treatment where it reduced the ADL significantly ($p<0.05$) from 13.91 to 12.70%. Other treatments changed the ADL content of SCB but the differences were not significant. No significant difference was found in hemicellulose content of SCB according to different chemical treatment, however the figure as it was calculated (NDF-ADF) were lower in the treated SCB than the untreated (Table 1). Cellulose content of SCB was calculated as ADF-ADL. It showed siginificant variations due to the different treatments. The most effective treatment was H_2SO_4 where the cellulose content of SCB decreased from 54.20 to 49.30%. The difference was sigificant ($p<0.01$). On the contrary such treatment significantly ($p<0.01$) increased the ash content of SCB. The highest increment was in the NaOH treatment (Table 1).

2- Experiment 1:

Such alkali treatment significantly improved intakes from dry matter (IDM), organic matter (IOM) and digestible organic matter (IDOM) expressed as g/day/kg body weight$^{0.75}$ (Table 2).

Table 2. The daily intake from dry matter (IDM), organic matter (IOM) and intake of digestible rations containing SCB untreated or treated with differentchemical reagents (Experiment 1).

Season	Treatment	IDM (g)	IOM (g)	IDOM g/kg $W^{0.75}$
Summer	Untreated	261.75ABa	248.58ABa	9.25Aab
	NaOH	477.08a	422.93a	16.88a
	NaOH+Ca(OH)2	556.98B	493.09A	19.52b
	NH4 OH	544.90A	506.08B	22.76A
	Mean SE	45.17	39.92	2.12
Winter	Untreated	408.29ABC	348.30ABC	13.55ABC
	NaOH"	842.98AD	731.46AD	30.05AD
	NaOH+Ca(OH)2	882.20BaF	781.01BaF	36.76BE
	NH4 OH	700.97CEa	651.48CEa	25.32Ca
	H 2S O4	476.00DEF	441.04DEF	16.27DEa
	Mean SE	51.37	37.71	2.37
Overall mean	Untreated	343.16ABC	323.98ABC	11.64ABC
	NaOH	670.35A	594.37A	24.19A
	NaOH+Ca(OH)2	737.66B	653.05B	26.42B
	NH4 OH	631.61C	586.86C	24.18C
	Mean SE	51.14	50.42	2.34
Summer		460.18A	417.67A	17.10A
Winter		704.11A	637.06A	25.21A
	Mean SE	39.69	35.65	1.65

Within columns, treatments with similar subscripts differ significantly (small letters, $P<0.05$; capita letters, $P<0.01$)

Treatment with H_2SO_4 improved the intake values than the untreated SCB, but the differences were not significant. No significant difference was found between the different alkali treatments in their effect on intake data through Summer trial, but in Winter trial NH_4OH treatment exhibited significantly ($p<0.05$) lower results in IDM and IOM (g/day) than NaOH + $Ca(OH)_4$ treatment. The later treatment was the most effective treatment in increasing the intake data than other treatments, when the Summer and Winter trials were considered together (Table 2).

It is interesting to find the significant difference ($p<0.01$) in IDM, IOM and IDOM g/day/kg body weight$^{0.75}$ between the Winter and Summer trials. The figures were 704.11 vs 460.18, 637.06 vs 417.67 and 25.21 vs 17.10 g/day respectively.

Such chemical treatment improved the organic matter (OM) digestibility coefficient of SCB based diet. The effect was clear and significant through the winter trial (Table 3). The NaOH treatment was the most effective treatment in this regard. The crude protein (CP) digestibility followed the same trend as the OM in the Winter trial, but H_2SO_4 treatment significantly ($p<0.01$) reduced CP digestibility (44.45%) than the untreated SCB based diet (59.22%). Neutral detergent fiber (NDF), acid detergent fiber (ADF), hemicellulose (H) and cellulose (C) were significantly affected by alkali treatment. Considering the overall mean of the two seasonal trials, NaOH treatment was the most effective in improving the NDF digestibility (from 39.36 to 61.74%), while NH_4OH treatment was the effective treatment in increasing ADF digestibility (from 43.33 to 56.46%). Again NaOH treatment was the strongest alkali treatment studied in improving acid detergent lignin (ADL) and hemicellulose digestibility. The coefficient was significantly ($p<0.01$) increased from 14.33 to 29.62% and from 29.01 to 93.75% for ADL and H digestibility, respectively. Cellulose was also significantly ($P<0.01$) enhanced from 47.30 to 65.42% as the SCB was treated with NH_4OH. On the contrary, H_2SO_4 treatment seems to be ineffective in improving the digestibility coefficients of SCB based diet except it's significant ($p<0.01$) effect on H digestibility, which was improved from 21.40 to 84.18% (Table 3). No significant difference was found between Summer and Winter trials in the digestibility coefficients.

3- Experiment 2:

The intake of dry matter (IDM), orgainc matter (IOM) and intake of digestible organic matter (IDOM g/day/kg body weight$^{0.75}$), of SCB supplemented with 15% molasses and 3% urea are presented in Table 4.

Such treatment significantly increased the intake data. The most pronounced effect was that of NH_4OH treatment. The IDM was sharply increased from 359.03 to 545.84 g/day as SCB was treated with NH_4OH. The increment level was 52.03%. Similar trend was observed for IOM g/day and IDOM/kg body weight$^{0.75}$ (g/day). They changed from 338.75 to 510.30 g/day ($p<0.01$) and from 17.80 to 25.47 g/kg$^{0.75}$ /day ($p<0.05$). The NaOH + Ca $(OH)_2$ treatmenrt showed the weakest effect, however the imporovement was also significant ($p<0.05$) regarding IDM and IDOM/kg$^{0.75}$. The NH_4OH treatment was significantly effective than NaOH + Ca $(OH)_2$ treatment in increasing IDM and IOM g/day (Table 4).

The digestibility coefficients of SCB nutrients in experiment 2 as affected by different alkali treatments are presented in Table 5. All treatments improved the OM digestibility. The most effective one was NaOH treatment. The improvement was significant ($p<0.05$) when NaOH treated SCB was compared with other treatments. The coefficients were 60.89 vs 54.86 and 55.30%, while the untreated SCB has a figure of 53.05%. On the other hand, NaOH treatment reduced CP and EE digestibilities of SCB diet. The depression appoached significance level ($P<0.01$)

Table 3. Digestibility coefficients % of organic matter (OM), crude protein (CP),ether extract (EE), neutral detergent fiber (NDF), acid detergent fiber (ADF), acid detergent lignin (ADL), hemicellulose (H) and cellulose (C) of the tested SCB tested rations.

Season	Treatment	OM	CP	EE	NDF	ADF	ADL	H	C
Summer	Untreated	45.97	57.62	58.81	39.76ABC	42.50Aab	11.63Aa	38.51ABC	42.00Aab
	NaOH	54.95	61.78	58.63	60.28A	52 00a	35.59ABb	89.97Aa	59.47A
	NaOH+$Ca(OH)_2$	54.87	62.45	55.67	60.37B	52.03b	17.71B	92.88Bb	60.78b
	NH_4OH	58.50	62.31	58.54	60.79C	59.01A	22.87ab	68.63Cab	68.78A
	Mean SE	2.55	4.57	2.97	2.43	2.54	2 41	4.64	2.25
Winter	Untreated	46.27ABa	59.22AE	60.89	39.04ABC	44.00abc	16.49	21.40ABCD	51.54Aab
	NaOH	59.92AC	68.28BE	54.03	63.51ADa	55.32ad	25.89	96.78AE	61.73Ba
	NaOH+$Ca(OH)_2$	57.29Bb	62.43C	56.08	61.49BE	53.65be	21.83	90.54BF	61.58Cb
	NH_4OH	54.56a	60.23D	59.19	55.05CFa	54.42cf	23.71	57.79CEFG	62 74AD
	H_2SO_4	49.50Cb	44.45ABC	53.54	37.86DEF	43.06def	16.56	84.18DG	46.30BCD
	Mean SE	2.24	1.42	2.16	2.58	2.79	3.05	5.30	2.52
Overall mean	Untreated	64.14ABC	58.51	59.85	39.36ABC	43.33ABC	14.33ABa	29.01ABC	47.30ABC
	NaOH	57.71A	65.39	56.07	61.74A	53.80A	29.62ACD	93.75AD	60.72Aa
	NaOH+$Ca(OH)_2$	56.21B	62.44	55.90	60.99B	52.93B	20.00Ca	91.58BE	61.38B
	NH_4OH	56.31C	61.15	58.90	57.60C	56.46C	23.33BD	62.61CDE	65.24Ca
	Mean SE	1.63	1.75	1.71	1.54	1.75	1.99	3.34	1.30
Season	Summer	53.57	61.04	57.91	55.11	51.36	22.24	72.50	57.76
	Winter	54.51	62.54	57.55	54.77	51.85	21.98	66.63	59.46
	Mean SE	1.15	4.50	1.21	1.09	1.24	1 41	2.36	1.28

S C B represnts 75% of the ration.

Means within column having similar subscripts differ significantly (Small letters, $P<0.05$; capital letters, $P<0.01$)

considering EE digestibility coefficient (41.96 vs 30.67%). However all treatments studied decreased EE digestibility. All treatments enhanced NDF digestibility. The effect was significant when untreated SCB was compared with NaOH treated SCB (45.72 vs 56.69%). NaOH and NaOH + Ca $(OH)_2$ treatments improved ADF digestibility of the SCB based diet. Their effects were significantly higher than NH_4OH treated SCB ($P<0.05$). Digestibility of ADL was slightly improved by such treatment but the effect was not significant. Hemicellulose digestibility was significantly ($P<0.01$) improved by any of the treaments applied. The highest coefficient was 90.99% for NaOH treated SCB, while the untreated SCB has a figure 49.68%. Also NaOH treatment significantly ($P<0.05$) improved cellulose digestibility of the untreated SCB (57.60 vs 62.70%). The difference between NaOH and NH_4OH treatments (62.70 and 56.11%) was also significant ($P<0.05$). The effects of NaOH or NaOH + Ca $(OH)_2$ treatments on total water intake (TWI) and water excreted (WE) in faeces and urine and urine pH were obvious, while NH_4OH treatment had no effect in this regard (Table 6). The NaOH treatment significantly ($P<0.05$) increased TWI and WE. It's effect on urine pH was significant ($P<0.01$) when compared with untreated or NH_4OH treated SCB. The pH values were 8.80 compared with 6.64 and 7.00 respectively. The NaOH + $Ca(OH)_2$treatment had a mild effect in this context (Table 6)

Table 4. The daily intake from dry matter (IDM), organic matter (IOM) and digestible organic matter (DOMI) of SCB affected by different chemical treatment and supplemented with 15% molasses and 3% urea (Experiment 2).

Treatment	Intake		
	IDM	IOM	IDOM $g/KgW^{0.75}$
Untreated SCB	359.03Aab	338.75Aa	17.80abc
5% NaOH	518.41aC	458.02a	22.88a
2.5% NaOH + 2.5% Ca(OH)	495.18bcd	400.02c	20.40C
NH_4OH	545.84Ad	510.30Ac	25.47b
Mean SE	19.76	21.25	1.15

Means within column having the same subscripts are significantly differed (Small letters, $P< 0.05$; capital letters, $P<0.01$).

Table 5. Digestibility coefficients % of organic matter (OM), crude protein (CP), ether extract (EE), neutral detergent fiber (NDF), Acid detergent fiber (ADF), Acid detergent lignin (ADL), hemicellulose (H) and cellulose (C) of the tested SCB tested rations (Experiment 2).

Treatment	OM	CP	EE	NDF	ADF	ADL	H	C
Untreated S C B	53.05a	64.88	41.96A	45.72a	49.71	18.96	49.68ABC	57.60b
5% NaOH	60.89abc	61.74a	30.67A	56.69a	54.42a	21.61	90.99AE	62.70cb
2.5%NaOH+ 2.5%$Ca(OH)_2$	54.86ab	66.96a	33.86	53.46	52.06b	19.85	83.90B	59.75a
6% NH_4OH SCB	55.30c	64.82	35.22	52.39	48.77ab	19.80	75.78CE	56.11ac
Mean SE	1.12	0.91	1.73	1.10	1.00	0.41	2.89	1.21

Means within column having the same subscripts are significantly differed (Small letters, $P<0.05$; capital letters, $P<0.01$).

Table 6. Total water intake (TWI), total water excreted (TWE) and urine pH values of Ossimi rams fed SCB untreated or treated with different chemical reagents and supplemented with molasses 15% and 3% urea (Experiment 2).

Treatment	Measured Values		
	IWI.L/day	TWE.L/day	Urine pH
Untreated S C B	1.21ab	0.60a	6.64AB
5% NaOH	3.18Bac	1.64ab	8.80ACD
2.5% NaOH + 2.5% Ca(OH)	1.93bc	0.91	7.75BCA
6% NH_4OH S C B	1.15B	0.62b	7.00DE
Mean SE	0.30	0.19	0.23

Means within column having the same subscripts are significantly differed (Small letters, $P<0.05$; capital letters, $P<0.01$).

DISCUSSION

Treating SCB with different chemical reagents induced some changes in the composition of plant cell coustituents and cell wall components in particular. These changes varied according to the chemical reagents used. Treatment with NH_4OH increased crude protein content of SCB by 194.68% (Table 1). Sundstol, 1984; Fahmy, 1985; Jewell and campling, 1986; noted 86.6 to 125.0% improvment in the crude protein content of different ammoniated roughages. On the other hand NH_4OH is a week alkali reagent and its effect on fiber constituents is not as strong as sodium and calcium hydroxides (Owen *et al.,* 1984 and sundstol, 1984). The NDF and ADF contents of SCB were significantly decreased by NaOH and NaOH + Ca and H_2SO_4 treatments. A similar trend was previously reported by Ben-Ghedalia and Rubinstein, (1986); Maglad *et al., (*1986). The ADL content was also decreased by NaOH and NaOH + Ca $(OH)_2$ treatments of bagasse by 5.8 and 8.7% compared with the untreated bagasse respectively. In addition, sodium and calcium hydroxide are expected to increase the Na and Ca ions load in the feed (Table 1) and hence gastrointestinal tract as well. Higconcentration of dietary sodium in particular has its adverse effect on palatability and induce faster rate of passage of ingested nutrients (Berger, *et al.,* 1980 and Godwin and Williams, 1986). These disadvantages hind to some extent the improvement achieved in it's chemical and physical structure of cell wall constituents.

As the treated SCB became more digestible, faster rate of passage of digesta was induced, accordingly, the bulk and retention time of indigestible portion became smaller and the animals ate more in order to keep the constant gut fill capacity and to feel satiety. In the present study the intake of digestible organic matter (IDOM) $g/kg^{0.75}$ was improved by 107.8, 127.0 and 107.7% as SCB was treated with NaOH, NaOH + Ca $(OH)_2$ and NH_4OH respectively (Table 2). Fahmy and Ørskov (1984); Jewell and Campling (1986) and Mirgan, (1987) reported the same trend and the improvement in feed intake was in thr range of 13-52%.

Treatment of SCB with H_2SO_4 in winter season experiment improved the IDOM $(g/kg^{0.75})$ by 20.1%. It is obvious that the improvement obtained by alkali treatment was greater than the H_2SO_4 treatment. This can be explained as H_2SO_4 (2.4%) treatment led to an expected increase in S content by 0.8% units theoretically which represents 89% increase in the sulfur density of the bagasse. Excessive sulfur in the diet was considered as feed intake depressing factor (Johnson *et al.,* 1968; Bird, 1972; Fahmy and Klopfenstein, 1994). Unfortunately the sulfur content of the SCB used in this study was not determined.

The highly significant difference in feed intake between summer and winter season (Table 2) can be discussed on the basis of climatic changes and mainly the ambient temperature. Under El-Minia governorate conditions the differences in ambient temperature between summer and winter seasons are about 11.5 and 11.2 ^{o}C for maximum and minimum temperatures respectively. Heat stress in addition to the heat increment of the feed, force the animal to cease eating to avoid excessive heat production and reduce stress. In winter time, the ambient temperature is mild in the morning (22.2 ^{o}C), while it is -0.6 ^{o}C at night.

Accordingly, the animals ate more as energy is required and the heat increment helps to keep thermostasis (McDonald, *et al.,* 1982).

The feed intake data of SCB+concentrate mixture (Experiment 1, Summer Trial) and that of SCB supplemented with 15% molasses + 3% urea (Experiments 2) were comparable (Tables 2 and 4). In other words, the concentrate mixture that represents 25% of the SCB ration can be replaced by molasses (15%) plus urea (3%) without any adverse effect on intake or digestibility. Thus in the case of these mature animals the intact protein is not essential or at least is not a limiting factor, and the animals can depend entirely on the non protein nitrogen (NPN) in their feed (Stevenson, 1978, 1979 and Allison, 1980).

The overall means of improvements in organic matter digestibility (OMD) were 25.1, 21.8 and 22.0% for NaOH, NaOH + $Ca(OH)_2$ and NH_4OH respectively. Sodium hydroxide treatment was more effective in increasing the digestibility of OM, NDF, ADL and hemicellulose than other treatments. These improvements are well established and attributed to its drastic effect on cell wall components. On the other hand NH_4OH treatment induced the highest improvement in ADF and cellulose digestibility in particular. It is well known that NH_3 is a growth factor for most of rumen cellulolytic bacteria and it is a preferable N source to build up their own proteins (Bryant and Robinson, 1961 and Hungate, 1966). These may explain the improvements observed due to NH_4OH treatment. Treating SCB with H_2SO_4 improved the OM digestibility, but the improvement was significantly lower than that obtained by alkali treatment (Table 3). Dryden and Leng (1985) observed similar trend, but Benghedalia and Miron, (1984); found that the cell wall digestibility of SO_2 treated wheat straw then treated with NH_3, was increased from 49.2 to 77.8%. This apparent discrepancy in the effectiveness of SO_2 or H_2SO_4 treatment may be attributed to the acid treatment conditions (heat, pressure, reaction period and/or reagent concentration. Detailed studies are needed in this respect.

It is clear that the bottle neck nutrient in the improvement of SCB through chemical treatment is hemicellulose. Wood (1970) and Gould and Fahey, (1987), reported that such chemical reagent leads to dissociation of the lignocellulose component of the plant cell wall and separation of hemicellulose that became easily soluble fraction and thus increases the cellulose fermentability and digestibility.

Considering the water intake (WI), water loss (WL) and urine pH data (Table 6), it is clear that they were increased as the Na concentration in the treated SCB was increased. Water in the biological tissues acts as a buffer media to maintain the osmotic pressure and balance salts and ions in the body (Olsson and Mckinley, 1979). Animals may have used these excessive amounts of water intake to washout the excess of sodium ions. The observed change in urine pH towards the alkaline side can be attributed to the ingestion of alkali agents and its excretion through urine (Godwin and Williams, 1986).

It can be concluded that such chemical treatment improved the feeding value of SCB. Addition of molasses and urea to represent 15 and 3% of the SCB ration had no adverse effect and can replace the conventional concentrate mixture in the ration of mature sheep.

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معاملة مصاصة القصب بمعاملات كيميائية مختلفة واثرها على معاملات الهضم والكمية المأكولة منها

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اجريت تجربتين لتقييم مصاصه القصب سواء الغير معامله او تلك المعامله بايدروكسيد صوديوم ٥٪ ، ايدروكسيد صوديوم ٢,٥٪ + ايدروكسيد الكالسيوم ٢,٥٪ ، ايدروكسيد امونيوم ٦٪ وكذلك المعامله بحامض الكبريتيك ٢,٤٪ وذلك بتقديمها فى غذاء ذكور الاغنام الاوسيمى لتمثل ٧٥٪ من الماده الجافه المقدمه بينما باقى العليقه (٢٥٪) فكانت من الغذاء المركز التقليدى (مخلوط علف مركز)

واستخدم تصميم المربع اللاتينى فى اجراء هذه التجارب واجريت التجربه الاولى فى موسمى الصيف والشتاء لدراسة تاثير كل منهما على الكميه الماكول من الغذاء وكذلك معدلات الهضم وفى التجربه الثانيه اضيف كل من المولاس ليمثل ١٥٪ من المصاصه وكذلك اليوريا بعد اذابتها فى المولاس لتمثل ٣٪ من مصاصه القصب وتم احلالهما بدلا من المخلوط المركز التقليدى .

واوضحت النتائج ما يلى : -

١ -المعامله بالامونيا أدت إلى زيادة تركيز البروتين الخام من ٢,٨٢ الى ٨,٣١٪ للمصاصه المعامله .

٢ -انخفض تركيز كل من مستخلص الالياف المتعادل ، مستخلص الالياف الحامضى نتيجة للمعامله وبأيدروكسيد الصوديوم ، ايدروكسيد الصوديوم + ايدروكسيد الكالسيوم وكذلك المعامله بالحامض .

٣ -زاد المأكول من الماده الجافه والماده العضويه وكذلك المأكول من المادة العضويه المهضومة كنسبه من وزن الجسم الميتابوليزمى (حجم / كجم وزن جسم متيابوليزمى) وذلك نتيجة للمعامله بالقلويات بينما لم يكن للمعامله بالحامض أى تاثير فى هذا المجال

٤ -تحسنت معاملات الهضم للماده العضويه ، مستخلص الاليـاف المتعـادل والحـامضى ، الهيميسليلوز وكذلك السليلوز وكان التحسن معنويا نتيجة المعاملة بالقلويات .

٥ -اضافة المولاسى ليمثل ١٥٪ من المصاصه وكذلك اليوريا لتمثل ٣٪ من المصاصه يمكنها بنجاح ان يعوضا تأثير الاستغناء عن الماده المركزه التقليديه والتى كانت تمثل ٢٥٪ من العليقه .

٦ -زادت الكميات المأكوله من الماده الجافه والماده العضويه وكذلك المهضوم من الماده العضويه كنسبه من وزن الجسم الميتابوليزمى فى موسم الشتاء عنه فى موسم الصيف وكانت هذه الزيادة عاليه المعنويه حيث كانت القيم على الترتيب ٤٦٠,١٨ جم / يوم ، ٤١٧,٦٧ جم/يوم ، ١٧,١٠ جم / يوم / كجم وزن جسم ميتابوليزمى فى الصيف مقارنه بـ ٧٠٤,١١ حم / يوم ، ٦٣٧,٠٦ جم / يوم ، ٢٥,٢١ حم / يوم/ كجم وزن جسم متيابوليزمى فى الشتاء .