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SUGAR CANE TOPS SILAGE AS RUMINANTS FEEDSTUFF:
3- EFFECT ON LAMBS' GROWTH PERFORMANCE, SEMEN PHYSICAL PROPERTIES AND BLOOD SERUM CONSTITUENTS*

(With 3 Tables and 3 Figures)

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سيلاج قمم نبات قصب السكر كغذاء للمجترات:
٣- التأثير على أداء نمو الحملان و الخصائص الطبيعية للسائل المنوي ومكونات مصل الدم

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تهدف هذه الدراسة للبحث فى تأثير التغذية على السيلاج الغير معـامل والسـيلاج المعامل (١% يوريا و ٣% مولاس) والسيلاج المعامل مع إضافة الخميرة إلى مخلوط المركزات على أداء نمو الأغنام والصفات الطبيعية للسائل المنوى وبعض مكونات مصل الدم. تم توزيع اثنا عشر حمل من الأغنام الأوسيمي عمر ستة اشهر ومتوسط أوزانها ٣١,٧٥±٠,١٦ كجم بصورة عشوائية على أربع مجاميع متساوية. غذيت الحملان في كل المجموعات بصورة منفردة لمدة ٢٤٠ يوم. تم تسجيل الغذاء المأكول يومياً والوزن كل أسبوعين. جُمعت عينات السائل المنوي كل أسبوعين خلال الثلاثة أشهر الأخيرة من التجربة ، وعينات الدم كل أسبوع خلال الثلاث أسابيع الأخيرة من التجربة. أظهرت النتائج عدم وجود اختلافات (عند مستوى معنوية ٥%) في معدل النمو اليومي بين المجموعات المختلفة ولكن معدل النمو اليومي كان يميل إلى الارتفاع في حالة الحملان المغذاة على تبن القمح والسيلاج الغير معامل عن تلك المغذاة على السيلاج المعامل أو المعامل مع الخميرة . زاد المأكول اليومي من المادة الجافة بدرجة معنوية (عند مستوى٥ %) للحملان المغذاة على تبن القمح عن المغذاة على السـيلاج الغـير معامـل أو المعامـل أو المعامل مـع الخمـيرة ،

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ولكن لا توجد اختلافات معنوية في المادة الجافة المأكولة بين كل من السيلاج غير المعامل والمعامل والمعامل مع الخميرة. ارتفع المأكول اليومي في صورة مركبات مهضومة ومعادل نشا عند تغذية الحملان على تبن القمح والسيلاج الغير معامل مقارنة بالتغذية على السيلاج المعامل أو المعامل مع الخميرة. وأظهرت الحملان المغذاة على تبن القمح إرتفاعاً معنوياً (عند مستوى ٥%) في كمية المادة الجافة المأكولة لكل وحدة نمو عن المغذاة على السيلاج الغير معامل والمعامل والمعامل مع الخميرة ، بينما لم تكن هناك اختلافات معنوية بين جميع المعاملات المختلفة من السيلاج. كما اظهرت الحملان المغذاة على السيلاج الغير معامل تحسناً ملحوظاً في كفاءة تحويل الغذاء إلى نمو في صورة مركبات مهضومة أو معادل نشا عن بقية المعاملات. سُجلت زيادة معنوية في حجم السائل المنوي للحملان المغذاة على السيلاج المعامل مع الخميرة (عند مستوى ٥%) عنه في الحملان المغذاة على السيلاج الغير معامل أوالمعامل أوتبن القمح. ازدادت حركة الحيوانات المنوية بدرجة معنوية (عند مستوى ٥%) عند تغذية الحملان على تبن القمح عنه عند تغذيتها على السيلاج الغير معامل أوالمعامل أوالمعامل مع الخميرة إلا أن الاختلافات بين جميع معاملات السيلاج لم تكن معنوية. وسُجلت زيادة معنوية في نسبة الحيوانات الميتة والشاذة في السائل المنوي للحملان المغذاة على السيلاج المعامل أوالمعامل مع الخميرة عن المغذاة على تبن القمح أو السيلاج الغير معامل. أما تركيز الحيوانات المنوية في المل من القذفة فكان يميل إلى الارتفاع في الحملان المغذاة على السيلاج الغير المعامل أوالمعامل عن الحملان المغذاة على تبن القمح أوالسيلاج المعامل مع الخميرة إلا أن الاختلافات بين المجاميع لم تكن معنوية. وأظهرت النتائج أن مصل دم الحملان المغذاة على السيلاج المعامل مع الخميرة كان أعلى (عند مستوى ٥%) في محتواه من البروتين الكلى والألبيومين عن دم الحملان المغذاة على تبن القمح والسيلاج الغير معامل. كما أنه لا توجد اختلافات معنوية بين الحملان المغذاة على العلائق المختلفة فى مستوى الجلوبيولين. وقد أدت تغذية الحملان على السيلاج المعامل إلى زيادة معنوية (عند مستوى ٥%) في تركيز اليوريا فى مصل الدم عنه عند تغذيتها على تبن القمح والسيلاج الغير معامل والمعامل مع الخميرة . كما ارتفع مستوى الكرياتينين بدرجة معنوية (عند مستوى ٥%) للحملان المغذاة على السيلاج المعامل مع الخميرة عن المغذاة على تبن القمح والسيلاج الغير معامل والمعامل. وكان مستوى إنزيم الاسبارتيت ترانس أمينيز أعلى في الحملان المغذاة على السيلاج المعامل عن بقية المجاميع. كما أن إنزيم الألانين ترانس أمينيز يميل إلى الارتفاع عند تغذية الحملان على الانواع المختلفة من السيلاج مقارنة بتبن القمح. ومن النتائج السابقة يمكن أن نستخلص أن سيلاج قمم نبات قصب السكر الغير معامل يعتبر مادة علف خشنة جيدة للحملان النامية حيث يعمل على تحسين القيمة الهضمية والأداء دون ظهور آثار سلبية أو اضطرابات فسيولوجية. كذلك فإن عمل السيلاج من قمم نبات قصب السكر بدون إضافات سوف يقلل من تكاليف التغذية ويجعل عملية السيلجة أكثر يسراً ويُخلص البيئة من إحدى مخلفات زراعة قصب السكر.

SUMMARY

A previous study on sugar cane tops silage indicated that the feeding value (TDN, SV and DCP) of sugar cane tops silage (SCTS) and sugar cane tops silage treated with 1% urea and 3% molasses (TSCTS) were

significantly higher ($p<0.01$) than those of wheat straw (WS) as reported by Soliman *et at.* (2002a). The present study was carried out to evaluate the performance of growing lambs fed WS, SCTS, TSCTS and TSCTS plus brewers yeast in concentrate mixture (TSCTSY). Twelve healthy Ossimi male lambs at six months of age with 31.75±0.16 kg average live body weight were randomly divided into four equal groups. Lambs of all groups were kept in individual pens. The experimental period lasted for 240 days. Feed intake was recorded daily and body weight biweekly. Semen was collected every two weeks at the last three months of the feeding trial. Blood samples were taken every week during the last three weeks of the study. The results showed that the differences in daily gain among all groups were not significant ($P>0.05$), but the daily gain tended to be higher in lambs fed wheat straw and SCTS than lambs fed TSCTS and TSCTSY. The daily DM intake of lambs fed wheat straw was significantly ($P<0.05$) higher than those of all other groups, but there were no significant differences in DM intake among the groups fed SCTS, TSCTS and TSCTSY. The TDN and SV intakes of lambs fed wheat straw and SCTS were higher than those fed TSCTS and TSCTSY. Lambs fed wheat straw showed significantly ($P<0.05$) higher DM intake per unit of gain than those fed either SCTS, TSCTS or TSCTSY, while, no significant differences among all silage treatments were observed. Feed conversion ratio (g TDN/g gain and g SV/g gain) were improved in lambs fed SCTS than other treatments. Semen volume of lambs fed TSCTSY was significantly ($p<0.05$) greater than those fed SCTS, TSCTS and wheat straw. Motility of sperms for lambs fed wheat straw were higher ($P<0.05$) than those fed SCTS, TSCTS and TSCTSY. The differences among SCTS, TSCTS and TSCTSY were not significant. Dead and abnormal sperms in semen of lambs fed TSCTS and TSCTSY were higher ($P<0.05$) than in those fed wheat straw and SCTS. Sperm concentration per ml tended to be higher for lambs fed SCTS and TSCTS than those fed wheat straw and TSCTSY. The differences among groups were not significant. Serum total protein and albumin for lambs fed TSCTSY were significantly higher ($P<0.05$) than those fed wheat straw and SCTS. There were no significant differences in serum globulin for lambs fed on different experimental rations. Serum urea concentration was significantly higher ($P<0.05$) for lambs fed TSCTS than those fed wheat straw, SCTS and TSCTSY. Serum creatinine for lambs fed TSCTSY was significantly higher ($P<0.05$) than those fed wheat straw, SCTS and TSCTS. Serum aspartate aminotransferase (AST) for lambs fed TSCTS was higher than all other groups. Serum

alanine aminotransferase (ALT) tended to be higher in lambs fed different types of silage than those fed wheat straw. From the previous results, it could be concluded that SCTS is a forage for growing lambs which improve the digestibility and performance without physiological disorders. Making silage from SCT without additives will decrease the feeding cost and alleviate the environmental consequences.

Keywords: *SCT, silage, feed conversion, semen properties, serum constituents.*

INTRODUCTION

Although sugar cane tops (SCT) are highly palatable forage with good voluntary consumption, animals either lose or just maintain their body weight or at the best they have very low levels of production when they were fed fresh SCT alone (Pate *et al.*, 1971 and Kevelenge *et al.*, 1983). The same authors found that the voluntary intake was 1.73 and 2.02 kgDM/100kg LW in steers and sheep respectively when fed fresh SCT alone. Ferreiro and Preston (1977) found that fine chopping of SCT decreased the voluntary intake while coarse chopping (5-15 cm length) increased it significantly. Kevelenge *et al.* (1983) found that ME intake by sheep was about 1433 Kcal when they were fed SCT alone. This figure is comparable with that recommended by ARC (1965) for sheep maintenance requirements (1310-1588 Kcal for lambs of 30-40 kg live weight). Abd El-Hafez *et al.* (1997) found that rams fed sugar cane tops silage (SCTS) showed 17% higher daily DM intake ($P<0.01$) than those fed concentrate mixture and wheat straw. Valvasori *et al.* (1995) found that dry matter intake of dairy cows decreased with increasing whole sugar cane level in the diet. However, addition of urea or dried poultry waste to SCT at ensiling time did not affect the dry matter intake of lambs (Kutty and Prasad, 1980 and Reddy and Prasad, 1982) and adult buffaloes (Chauhan, 1994). On the other hand, Arcos-Garcia (2000) Found that feed intake tended to be higher ($P<0.01$) in sheep fed SCT with yeast cultures (1390 g/day) compared with those fed SCT alone (1183 g/day).

Abd El-Hafez *et al.* (1997) found that feed conversion ratio in rams fed SCTS treated with 1% urea and concentrate contains live yeast culture was better than those fed wheat straw (6.73 *vs.*7.23 g TDN/g gain). Also, Reddy and Prasad (1982) reported that feed conversion ratio by lambs fed SCTS treated with 1.5% urea was better than those fed untreated SCT silage.

Ferreiro and Preston (1976) obtained an average daily gain (ADG) of 0.84 kg when zebu bulls were fed 1 kg rice polishing with fresh SCT. Meyreles and Preston (1982) and Meyreles *et al.* (1982) fed growing bulls SCT and molasses *ad libitum* with different sources of nitrogen and found that the ADG was 730, 510 and 660g when urea, poultry litter and wheat bran, respectively, were used. They also found that when bulls were fed mixtures of wheat bran and poultry litter or poultry litter and urea, ADG were 770 and 1001g, respectively. This explained the associative effect of feed ingredients on ADG. Abd El-Hafez *et al.* (1997) found that the addition of 1% urea to SCT at ensiling improved daily gain of lambs by 50% than those fed wheat straw. Also, Reddy and Prasad (1982) reported that 36% more daily gain was obtained when SCT silage treated with 1.5% urea was fed to lambs than when untreated SCT silage was fed.

The deficiency of protein in diet might be responsible for depressed testicular growth and spermatogenesis of rams (Oldham *et al.*, 1978). However, Mohamed (1998) found that semen volume, pH and sperm concentration of rams fed corn stover silage treated with 1% urea were lower than those fed untreated silage after one month of the first ejaculation. The same author found that the dead and abnormal spermatozoa were higher at puberty and at one month after the first ejaculation for lambs fed corn stover treated with urea. This may be attributed to the toxic effect of urea and ammonia on sperms (Dasgupta *et al.*, 1970). Similarly, Visek (1984) reported that not only urea but also ammonia is known to be harmful for mammalian cells and spermatozoa because both of them alter the endocrine function.

Losada *et al.* (1979) found that blood NH_3 (mg/100ml) of bulls fed a basal diet of sugar cane and molasses increased with increasing the amount of urea in the molasses. Bhattacharya and Pervez (1973), Koeln *et al.* (1981) and Koeln *et al.* (1985) found that blood urea-N and serum albumin were higher ($p<0.01$) in lambs fed diets supplemented with urea in comparison with those fed diets without urea. On the contrary, Abd El-Hafez *et al.* (1997) found that the serum total protein and globulin levels in lambs fed SCT silage treated with 1% urea were lower ($p<0.01$) than those fed the control ration. However, no discriminative differences were observed between control and treated groups regarding AST, ALT and serum urea-N level of blood. Daghash and Mousa (1994) indicated that blood serum total protein, globulin, urea-N and AST level tended to be lower in sheep fed diets supplemented either with 1.15 or 2% urea than those fed diet without urea.

This study aimed to investigate the effect of feeding SCT silage on lamb growth performance, semen characteristics and some serum constituents.

MATERIALS and METHODS

A feeding trial was conducted to study the effect of feeding treated or untreated sugar cane tops silage on the feed intake, growth rate, feed conversion ratio, semen quality and some blood serum constituents.

Experimental animals:

Twelve healthy Ossimi males (six months old and 31.75 ± 0.16 kg average body weight) were divided into four equal groups, according to their average live body weight. The average initial weights were similar in all groups. Lambs were kept in individual pens. The experiment lasted for 270 days and consisted of two periods, *i.e.* 30-days adjustment period followed by 240 days experimental period. Animals were weighed in two successive days every other week before morning feeding. Body weight was averaged to the nearest 0.1 kg.

Experimental rations:

The experimental rations were wheat straw (Control), untreated sugar cane tops silage (SCTS), sugar cane tops silage treated with 1% urea and 3% molasses (TSCTS) and sugar cane tops silage treated with 1% urea and 3% molasses plus concentrate mixture containing brewers yeast at the rate of 5kg /ton (TSCTSY). All animals of these groups were fed 60% of their requirements as concentrate mixture while WS, SCTS and TSCTS were given *ad libitum.* The composition of concentrate mixture was; yellow corn 37%, wheat bran 17%, rice bran 13%, undecorticated cotton seed meal 30%, limestone 2% and sodium chloride 1%. The quantity of concentrate mixture was adjusted every two weeks according to the change in body weight (NRC, 1985). Licks of vitamins-minerals and fresh water were available free choice. Rations were offered once daily at 8.00 a.m. and the feed orts were weighed daily through the experimental period and actual feed intake was calculated. Feed conversion ratio was calculated and expressed in terms of dry matter (DM), total digestible nutrients (TDN) and starch value (SV) grams per one-g body weight gain.

Blood sampling:

At the last two weeks of the feeding trial, weekly blood samples (10 ml each) were collected from the jugular vein after the morning

feeding. The 3rd blood sample was collected just before slaughtering. Blood sera were stored at -20°C until analysis. Serum total protein was determined according to Henry (1964) using assay kits supplied by Biocon, Egypt. Serum albumin was determined according to Webster (1974) using assay kits supplied by Biocon, Egypt. Serum globulin was obtained as the difference between the total protein and albumin concentration. Serum aspartate aminotransferase (AST) and alanine aminotransferase (ALT) were determined according to Reitman and Frankel (1957) using assay kits supplied by Diamond, Egypt. Serum urea-N was measured according to Patton and Crouch (1977) using assay kits supplied by Diamond, Egypt. Serum creatinine was determined according to Henry (1974) using assay kits supplied by Diamond, Egypt.

Semen characteristics:

During the last 4 months of the feeding trial, all lambs were allowed for daily training for 4 weeks using teaser ewes for sexual stimulation and adaptation to the artificial vagina for semen collection. After that, semen was collected throughout the last three months of the feeding trial. One ejaculate was collected every two weeks using artificial vagina to estimate: 1. Ejaculate volume (ml) which was measured using a graduated collecting tube to the nearest 0.1 ml; 2. Semen pH which was immediately recorded using a pH paper; 3. Initial motility which was assessed by microscope examination on a score frame to 100%; 4. Percentage of dead and abnormal sperm cells which was estimated according to the method of Hancock (1951), and 5. Sperm concentration which was measured by using hemocytometer slide according to the method described by Laying (1970).

Statistical Analysis:

The experimental design was the complete randomized design (CRD). The data were statistically analyzed using general linear model (GLM) procedure of SAS (1998). The significance differences between treatment means were tested by Duncan Multiple Range Test (Steel and Torrie, 1982).

RESULTS and DISCUSSIONS

Feed intake:

The chemical composition, digestibility coefficients and nutritive value (TDN, SV and DCP) of wheat straw, silage and the concentrate mixture used in this study were reported by Soliman *et al.* (2002a). The

daily DM, TDN and SV intakes of lambs fed wheat straw, SCTS, TSCTS or TSCTSY are presented in Table 1. The results indicated that daily DM intake of lambs fed wheat straw was significantly ($P<0.05$) higher than those fed SCTS, TSCTS and TSCTSY. However, there were no significant differences in DM intake among SCTS, TSCTS and TSCTSY groups. Feed intake by lambs fed TSCTS tended to be about 9.20 and 6.93% lower than those fed SCTS and TSCTSY, respectively. This reduction in DM intake may be due to less palatability of TSCTS because of urea supplementation which results in increasing the level of ammonia in silage and consequently in the rumen. These results supported the earlier results reported by Wilkins *et al.* (1971) and Bhattacharya and Pervez (1973) who found negative correlation between silage intake and ammonia level in the silage. Furthermore, Losada *et al.* (1979) reported that the elevation of rumen ammonia levels after feeding depressed growth of microbial population and decreased fermentable sugars available for bulls fed sugar cane silage with molasses which are considered as reasons for the decreased feed intake. Mohamed (1998) observed that voluntary DM intake was about 6.34% lower in lambs fed corn stover silage with urea than in lambs fed corn stover silage without urea. In contrast, Zedan (1998) found no differences among groups in total feed intake for cows fed on wheat straw, SCTS and corn stover silage (9.41, 9.38 and 9.70 kg/h/d, respectively).

The results in the same table showed that lambs fed the TSCTSY tended to have a higher DM intake than those fed TSCTS. Such high intake may be due to an increase in the efficiency of rumen microbial fermentation of dietary DM or increase of the feed palatability due to addition of yeast culture which in turn increase feed consumption. These results agreed with those reported by Arcos-Garcia (2000) who found that the intake tended to be higher ($P<0.10$) in sheep fed SCT with yeast cultures than those fed the control. Similarly, Adams *et al.* (1981) showed that yeast culture supplementation for growing steers diets improved feed intake. However, Arambel and Kent (1990) and Plata *et al.* (1994) reported that the dry matter intake was not affected by addition of *saccharomyces cerevisiae* to dairy cows ration.

The highest TDN intake was recorded with lambs fed wheat straw which was significantly ($P<0.05$) higher than those fed either TSCTS or TSCTSY by 16.19 and 11.55%, respectively. At the same time, lambs fed SCTS consumed higher TDN than those fed TSCTS and TSCTSY. However, no significant differences were observed among SCTS, TSCTS and TSCTSY groups. The same trend was noticed with

SV intake while the differences were not significant among all groups. The trend of DCP intake among groups was in contrary to that of TDN intake. These results my be due to higher DM intake by lambs fed wheat straw.

Body weight change and daily gain:

Results presented in Table 1 show the average body weight (BW) and average daily gain (ADG) of lambs fed diets based on wheat straw, SCTS, TSCTS and TSCTSY. The differences among all groups in daily gain were not significant (P>0.05). However, the daily gain tended to be higher in lambs fed on wheat straw than other treatments, which might be due to higher DM and TDN intakes and lower DCP intake from wheat straw than silages. Although WS and SCTS groups consumed similar amounts of TDN and different amount of DCP, being higher in SCTS than WS, they showed similar ADG. The amount of TDN consumed by the SCTS group might be not enough to utilize the excess DCP consumed.

Table 1: Effect of feeding untreated and treated sugar cane tops silage on feed intake, average weight gain and feed conversion ratio for Ossimi lambs.

Items*	Control	SCTS	TSCTS	TSCTSY	SEM	Prob.
Feed Intake (FI, g/day):						
DMI of concentrate	627.72	599.19	599.19	599.19	22.46	0.7508
DMI of roughage	562.66^{a}	288.19^{b}	213.46^{c}	269.81^{bc}	24.88	0.0001
Total DM intake	1190.38^{a}	887.38^{b}	812.65^{b}	868.99^{b}	42.29	0.0001
TDN intake	676.82^{a}	615.66^{ab}	567.24^{b}	598.66^{b}	25.61	0.0257
SV intake	542.94	522.81	486.47	505.11	20.41	0.2475
DCP intake	69.64^{b}	85.04^{a}	88.18^{a}	90.70^{a}	9.16	0.0001
Body weight change and daily gain:						
Feeding period(day)	240	240	240	240	--	--
Initial body weight (kg)	31.93	31.73	31.77	31.53	2.71	0.999
Final body weight (kg)	56.23	53.30	49.97	50.40	2.34	0.278
BW gain (kg)	24.30	21.57	18.20	18.87	2.38	0.320
Daily gain (g)	91.06	89.79	77.92	77.22	10.24	0.675
Feed conversion ratio (g/g gain):						
DM	13.07^{a}	9.88^{b}	10.43^{b}	11.25^{b}	0.50	0.0001
TDN	7.43	6.86	7.28	7.75	0.31	0.2282
SV	5.96	5.82	6.24	6.54	0.25	0.1767
DCP	0.76^{c}	0.95^{b}	1.13^{a}	1.17^{a}	0.11	0.0001

* Values are least- squares means (L.S.M.) of 3 rams/treatment.

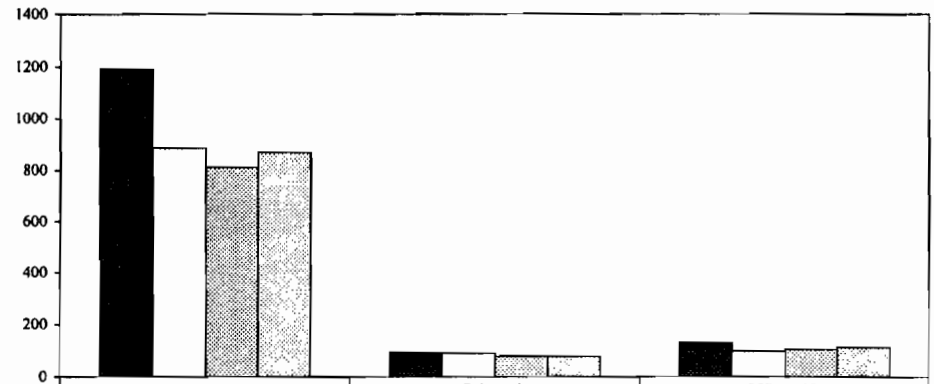
SEM : Standard error of least-squares means.

^{a,b,c} Means of the same row in each trial with different superscripts are significantly different (P<0.05).

SCT = green sugar cane tops; Control = wheat straw; SCTS = sugar cane tops silage; TSCTS = treated sugar cane tops silage with 1% urea and 3% molasses and TSCTSY = treated sugar cane tops silage + brewers yeast in concentrate mixture.

These results are in agreement with those reported by Deville *et al.* (1979) who found that the average daily gain of cattle fed fresh fodder was higher than those fed on sugar cane tops silage. In spite of increasing the value of nutrient digestibility and feeding value of TSCTS, the daily gain in lambs fed on TSCTS and TSCTSY was lower than those fed SCTS (77.92 and 77.22 *vs.* 89.79 g, respectively). This might be due to the decrease in DM intake from silage treated with urea as compared with untreated silage (Figure 1) which reflect the less palatability of silage treated with urea. Ortigues *et al.* (1988) reported that the weight loss of wethers fed the urea diets resulted from energy requirement for excreting excess N in the form of urea. The results also agreed with those reported by Bhattacharya and Pervez (1973) who observed that the daily gain tended to be lower in lambs fed ration containing urea than control.

Figure 1: Dry matter intake (DMI), daily gain and feed conversion ratio (FCR) of lambs fed sugar cane tops silage.



	DMI (g/d)	Gain (g/d)	FCR (x 10)
Control	1190.38	91.06	130.7
SCTS	887.38	89.79	98.8
TSCTS	812.65	77.92	104.3
TSCTSY	868.99	77.22	112.5

Feed conversion ratio:

Feed conversion ratio expressed as g DMI, TDN, SV and DCP/g gain of lambs fed wheat straw, SCTS, TSCTS and TSCTSY are shown in Table 1. Lambs fed wheat straw showed significantly ($P<0.05$) higher DM intake per unit of gain than those fed SCTS, TSCTS and TSCTSY (Figure 1). Although no significant differences were observed among SCTS, TSCTS and TSCTSY, numerical differences were found among them (0.55 and 1.37 unit DM /unit gain). Lambs fed SCTS recorded lower TDN intake unit/unit of gain than lambs fed wheat straw and treated sugar cane tops silage. The highest SV required for each gain unit was observed in lambs fed TSCTSY followed by TSCTS then the control but these differences were not significant ($P>0.05$). These results may be due to the higher TDN and SV content for TSCTS than wheat straw or due to higher nutrient intake of TSCTS and TSCTSY groups as TDN and SV which was associated with comparable daily gain. These results are in agreement with the reported values of Abd El-Hafez *et al.* (1997) who found that feed conversion as g DM/g gain was better by 28% in lambs fed sugar cane tops silage treated with 1% urea than wheat straw. Also, Reddy and Prasad (1982) indicated that addition of 1.5% urea during making SCT silage improved feed conversion (g DM/g gain) by 25.74% as compared with untreated group. Lambs fed WS showed the lowest g DCP/g gain which could be attributed to the lower DCP consumed and higher BWG by WS group than silages groups.

Semen physical properties:

Data of semen physical properties are presented in Table 2. The studied properties are semen volume, semen pH, sperm motility %, dead spermatozoa, abnormal spermatozoa and sperm concentration per ml.

Volume:

Average semen volume of rams fed treated sugar cane tops plus brewers yeast in concentrate mixture (TSCTSY) was significantly ($p<0.05$) higher than those fed either TSCTS, SCTS or wheat straw. Also the semen volume of rams fed TSCTS was significantly higher ($P<0.05$) than those fed the SCTS diets. Such increase in semen volume may be due to raising the digestible crude protein content of silage treated with urea (Abd El-Hafez *et al.*, 1997 and Mohamed, 1998). Cole and Cupps (1977) and Hafez (1980) indicated that increasing protein intake increases the level of gonadotrophins, follicle stimulating hormone (FSH) and interstitial- cell stimulating hormone (ICSH) which are protein based. Such increase in gonadotrophins mainly ICSH and

Luteinizing hormone (LH) is followed by an increase in the level of testosterone (Coulter, 1986). Testosterone activates the secretory function of the accessory glands (Salisbury *et al.*, 1978) which, in turns, increases the seminal volume. These result agreed with El-Azab *et al.* (1998) findings that rams fed on ammoniated rice straw appeared to be higher than those fed untreated rice straw regarding semen volume (0.60 *vs.* 0.42 ml).

Table 2: Effect of feeding untreated and treated sugar cane tops silage on semen physical properties of rams.

Items*	Control	SCTS	TSCTS	TSCTSY	SEM	Prob.
Volume (ml)	0.99^{bc}	0.84^{c}	1.03^{b}	1.25^{a}	0.04	0.008
pH	7.4^{ab}	7.6^{a}	7.15^{c}	7.20^{bc}	0.06	0.015
Motility (%)	90.00^{a}	79.00^{b}	73.00^{b}	71.00^{b}	2.74	0.026
Dead sperm (%)	28.75^{b}	34.18^{b}	47.56^{a}	49.30^{a}	0.13	0.003
Abnormal sperm (%)	9.19^{b}	10.10^{b}	14.54^{a}	13.56^{a}	1.83	0.026
Sper. Conc.x10^6 / ml	3.48	3.86	3.70	3.51	0.83	0.261

* Values are least- squares means (L.S.M.) of 3 rams/treatment.
SEM : Standard error of least-squares means.
^{a,b,c} Means of the same row in each trial with different superscripts are significantlydifferent (P<0.05).
Control = wheat straw; SCTS = sugar cane tops silage; TSCTS = treated sugar cane tops silage with 1% urea and 3% molasses and TSCTSY = treated sugar cane tops silage + brewers yeast in concentrate mixture.

pH:

The average pH value of semen presented in Table 2 for rams fed wheat straw and SCTS was significantly higher (P<0.05) than those fed TSCTS and TSCTSY (7.4 and 7.6 vs. 7.15 and 7.20, respectively). These results are in agreement with El-Azab *et al.* (1998) who found an increase (P<0.01) in semen pH value of rams fed untreated rice straw in comparison with those fed ammoniated rice straw. Also, Mohamed (1998) indicated that lambs fed untreated corn stover was higher in semen pH value than those fed ureated corn stover silage (7.38 *vs.*7.25) at puberty.

Motility:

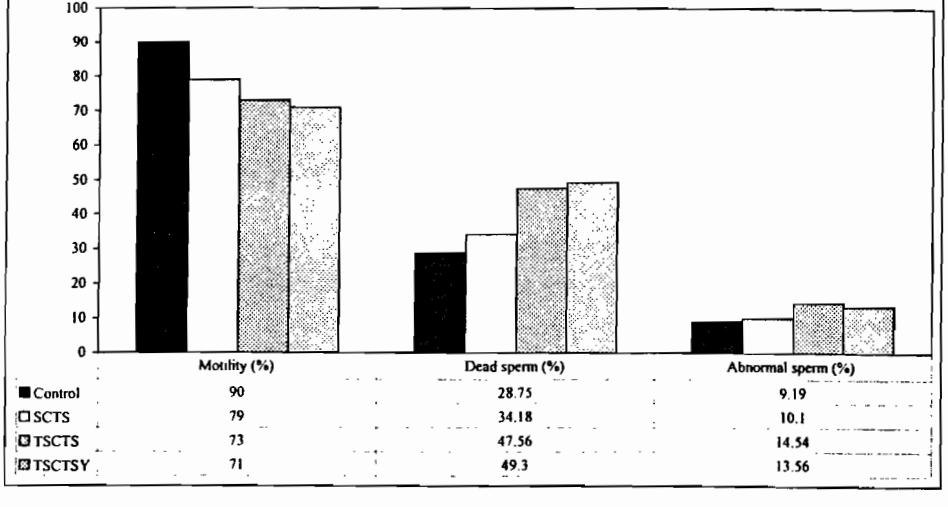
Data presented in Table 2 showed that average spermatozoa motility of rams fed wheat straw was the highest (P<0.05) among all other treatments (Figure 2). However, the differences between SCTS, TSCTS or TSCTSY were not significant (P>0.05). The lower motility of spermatozoa is thought to be a result of the high amount of urea consumed which ruminaly converted to ammonia and absorbed through the rumen wall, this ammonia level was beyond the capability of liver

limit to transfer it to urea. Ammonia is considered a toxic by-product of rumen metabolism and can reduce fertility (Ferguson and Chalupa, 1989). Similarly, Johanson *et al.* (1971) reported that the sperm motility of bulls fed urea-purified diet was lower than those fed natural diet (13 *vs.* 15%). Also, Mohamed (1998) found that lambs fed untreated corn stover silage was higher ($P<0.05$) than those fed ureated corn stover silage regarding motility of spermatozoa at puberty. In another study on dairy cows, Willard (1984) suggested that the high plasma urea nitrogen and ammonia-N might increase the pH in the reproductive tract and reduce motility and survival of sperm.

Dead spermatozoa:

The average percentage of dead spermatozoa (Table 2 and Figure 2) of rams fed TSCTS and TSCTSY was significantly higher at 5% level than those fed wheat straw and SCTS (47.56 and 49.30 *vs.* 28.75 and 34.18%, respectively). These results might be due to elevation of ammonia, urea and other unidentified nitrogenous compounds in the blood which led to elevation of urea and ammonia in the reproductive tissues and fluids (Jordan *et al.*, 1983; Willard, 1984 and Carroll *et al.*, 1987). Urea and ammonia have been shown to be toxic to sperm

Figure 2: Some semen characteristics (sperm motility, dead sperm percentage and abnormality) of rams fed sugar cane tops silage.



(Dasgupta *et al.*, 1970) and to alter endocrine function (Visek, 1984). These results agreed with the finding of Mohamed (1998) who found that semen of lambs fed ureated corn stover silage had higher dead spermatozoa at puberty than those fed untreated corn stover (35.33 *vs.* 30.33%). Similarly, Al-Haboby *et al.* (1999) reported that the dead sperm percentages were greater by 13.2% in the semen of rams fed urea feed blocks than those fed the control diet.

Abnormal spermatozoa:

Average abnormal spermatozoa percentages (Table 2 and Figure 2) of lambs fed TSCTS and TSCTSY were higher ($P<0.05$) than those fed wheat straw and SCTS (14.54 and 13.56 *vs.* 9.19 and 10.10%, respectively). These results agreed with the findings of Johanson *et al.* (1971) who found that the sperm abnormalities of bulls fed urea-purified diet were higher than those fed natural diet (59 *vs.* 55%). Similarly, Mohamed (1998) reported that lambs fed ureated corn stover silage was higher ($P<0.05$) in abnormal spermatozoa than those fed untreated corn stover at puberty and after one month of the first ejaculation.

Sperm concentration per ml:

The averages of sperm concentration per ml (Table 2) of rams fed wheat straw, SCTS, TSCTS and TSCTSY were 3.48, 3.86, 3.70 and 3.51x 10^6, respectively. Although the differences between groups were not significant, rams fed the SCTS diet had numerically higher value than those fed TSCTS and TSCTSY. In this respect, Johanson *et al.* (1971) reported that the bulls fed natural diet were better than those fed urea-purified diet with respect to total sperm production. They added that urea fed bulls capable to synthesize all hormones and amino acids required for fertility. Also, Mohamed (1998) found that the sperm concentration per ml for lambs fed corn stover were higher ($P<0.05$) than those fed ureated corn stover silage at puberty. Jordan and Swanson (1979) postulated that production of ammonia or other substances in the rumen might reduce fertility in dairy cows by lowering plasma progesterone.

Blood serum constituents:

The data of the serum parameters are summarized in Table 3. Results indicated that the average values of total protein in blood serum of rams fed TSCTSY were significantly higher ($P<0.05$) than those fed wheat straw or SCTS (8.79 *vs.* 7.39 and 7.56 g /dl, respectively; Figure 3). This might be explained by the higher DCP intake in silages groups than WS group. Serum total protein was considered normal as stated by

Kaneko (1980) who extracted values from several studies on sheep under normal conditions being 6.0-7.9 g/dl. Similarly, serum albumin was significantly higher (P<0.05) for rams fed TSCTSY than those fed wheat straw and TSCTS (5.10 *vs.* 3.27 and 3.86 g/dl, respectively). Such increase in total protein and albumin for rams fed TSCTSY may be due to high protein intake, which increase amino acids available for absorption and metabolism (Baillet *et al.,* 1998). Hallford *et al.* (1982) found that high protein intake increases serum albumin concentration. Similarly, Harper (1975) indicated that serum albumin is synthesized in the liver from amino acids. The data in Table 3 revealed that there were no significant differences (P>0.05) in serum globulin among different experimental rations. Also, Etman *et al.* (1992) and Mohamed (1998) reported that the concentration of total protein, albumin and globulin were higher in blood plasma of lambs fed a ration containing ureated or ammoniated corn stalk or corn stover silage than those fed untreated one.

Table 3: Effect of feeding untreated and treated sugar cane tops silage to lambs on some blood serum constituents.

Items*	Control	SCTS	TSCTS	TSCTSY	SEM	Prob.
Total Protein, g/dl	7.39^{b}	7.56^{b}	8.19^{ab}	8.79^{a}	0.358	0.084
Albumin, g/dl	3.27^{c}	4.78^{ab}	3.86^{bc}	5.10^{a}	0.348	0.021
Globulin, g/dl	4.12	2.78	4.33	3.69	0.558	0.284
Urea, mg /dl	17.69^{c}	22.64^{bc}	41.10^{a}	30.66^{b}	2.555	0.001
Creatinine, mg /dl	0.38^{b}	0.39^{b}	0.51^{ab}	0.62^{a}	0.050	0.032
AST, Unit/ l	26.90^{c}	30.25^{c}	45.34^{a}	38.70^{b}	1.493	0.0001
ALT, Unit/ l	4.68^{b}	5.64^{ab}	6.57^{ab}	7.30^{a}	0.572	0.0529

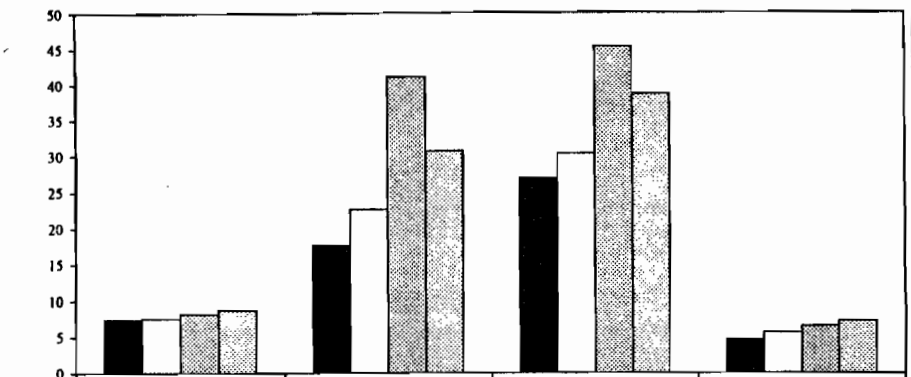
* Values are least- squares means (L.S.M.) of 3 rams/treatment.
SEM : Standard error of least-squares means.
^{a,b,c} Means of the same row with different superscripts are significantly different (P<0.05).
Control = wheat straw; SCTS = sugar cane tops silage; TSCTS = treated sugar cane tops silage with 1% urea and 3% molasses and TSCTSY = treated sugar cane tops silage + brewers yeast in concentrate mixture.

The serum urea concentration was significantly higher (P<0.05) in rams fed TSCTS than those fed either wheat straw, SCTS or TSCTSY (41.10 *vs.* 17.69, 22.64 and 30.66 mg /dl, respectively; Figure 3). This may be related to higher nitrogen intake by lambs fed TSCTS. Excess ammonia produced in the reticulo-rumen is absorbed either there or in the lower gastrointestinal tract, transported to the liver, and converted to urea (Ellen *et al.*, 1983). In this respect, an elevation of rumen pH occurred in rams fed TSCTS (Soliman *et al.*, 2002b) as a result of the rapid hydrolysis of urea to carbon dioxide and ammonia (Chalupa, 1968). The rapid urea hydrolysis increases absorption of ammonia in the

rumen, which facilitate the ammonium ion penetration through the lipid layers of the rumen mucosa (Hogan, 1961 and Bloomfield *et al.*, 1963). On the other hand, Madsen (1983) stated that when amino acids are utilized in the liver for gluconeogenesis, the amino groups are converted into urea. Preston *et al.* (1965) found a high correlation between N-intake and blood urea nitrogen. Although the serum urea values in Table 3 showed the presence of significant differences among treatments, they were within the normal range abstracted by Kaneko (1980) from several studies on sheep under normal conditions being 17.15 - 42.86 mg/dl.

Blood creatinine is a product of nitrogen metabolism. The rate of blood creatinine production may be considered as an index of endogenous protein catabolism (Patrick *et al.*, 1998). The average value of Creatinine in serum obtained from lambs fed TSCTSY were significantly higher ($P<0.05$) than those fed wheat straw and SCTS (0.62 *vs.* 0.38 and 0.39 mg/dl). However, no significant differences were observed between TSCTS and TSCTSY.

Figure 3: Some blood serum constituents of lams fed sugare cane tops silage



	Total protein (g/dl)	Urea (mg/dl)	AST (unit/l)	ALT (unit/l)
Control	7.39	17.69	26.9	4.68
SCTS	7.56	22.64	30.25	5.64
TSCTS	8.19	41.1	45.34	6.57
TSCTSY	8.79	30.66	38.7	7.3

The values estimated for AST and ALT were within the normal levels recorded by Mottelib and El-Naggar (1980), from their several studies on sheep under normal conditions. The average value of AST in

blood serum of lambs fed TSCTS was higher (P<0.05) than those fed wheat straw, SCTS and TSCTSY (45.34 *vs.* 26.90, 30.25 and 38.7 Unit/l, respectively). Also, it was noticed that lambs fed TSCTSY were significantly higher by 30.49 and 21.83% for AST than those fed wheat straw and SCTS, respectively (Figure 3). Also, lambs fed TSCTSY were significantly higher for ALT than those fed wheat straw (7.30 *vs.* 4.68 Unit/l; Figure 3) but the difference between TSCTS and TSCTSY groups was not significant (P>0.05). The serum levels of transaminases enzymes (AST and ALT) are dependent on the biosynthesis of amino acids by rumen bacteria (Allison, 1969) and amino groups of alanine and glutamine taken up by the liver (Madsen, 1983). Davidson (1994) reported that the function of ALT enzymes is the transfer of amino group from amino acid to synthesize another one and play an important role in gluconeogensis. Increases of both AST and ALT in blood serum for lambs fed TSCTS and TSCTSY may be due to the higher alanine and glutamine in blood serum. Clifford and Tillman (1968) reported a slight increase in the free amino acid content of plasma of sheep fed the urea purified diet compared to those fed the isolated soy diet. Bergman (1983) reported that alanine and glutamine are released continuously by muscle and are removed by liver for glucose and urea synthesis. The higher level of blood urea concentration for this groups is clearly explained by the results of these enzymes.

In conclusion, SCTS is a good feed for growing lambs since it improved the digestibility and performance without physiological disorders. Making silage from SCT without additives will decrease the feeding cost and ensilage process will be more easily. The results of this study have also confirmed the findings of other workers who found that supplement of urea to poor quality roughages did not increase voluntary intake above the maintenance levels especially in growing animals.

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