EFFECT OF BIOLOGICAL TREATMENT ON IMPROVEMENT OF SUGARCANE BAGASSE, NUTRITIVE VALUE AND ITS EFFECT ON PRODUCTIVE PERFORMANCE OF LACTATING BUFFALOES.

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SUMMARY

The objective of the present investigation was to study the effect of biological treatment on improvement of sugarcane bagasse nutritive value and its effect on productive performance of lactating buffaloes. Sixteen lactating buffaloes have weight on an average 570±15 kg were divided randomly into four groups A, B, C and D (four animals each). Animals of group A with treatment (T1) were fed sugarcane bagasse (SCB) untreated *ad lib* + concentrate feed mixture (CFM) and served as control. The animals in group B were fed (T2) SCB with treated *Trichoderma harzianum* + CFM. Animals in group C were fed (T3) SCB with treated *Saccharomyces cerevisiae* + CFM. Whereas animals in group D were offered (T4) SCB with treated *Trichoderma harzianum* + *Saccharomyces cerevisiae* + CFM. A digestibility trail was conducted to determine the digestibility coefficient and nutritive value of the tested rations using twelve adults Ossimi rams. The results revealed that the biological treatments recorded highest digestibility coefficients ($P<0.05$) for all nutrients and nutritive value compared with control. T4 had better ($P<0.05$) nutrients digestibility coefficients, fiber fractions digestibility and nutritive value compared with T2 and T3. The biological treatments recorded better cost for milk production (kg milk yield) for T4, T2 and T3, respectively compared with the control.

Keywords: *biological treatments, sugarcane bagasse, digestibility coefficients, feeding value, lactating buffaloes.*

INTRODUCTION

Forages are the cheapest source of livestock feeding in developing countries (Bilal, 2008) and Egypt is not an exception. Besides forages other agricultural residues are second major source of feeding for livestock. In Egypt, there are about 30 million tons of agricultural residues available per year. Rice straw and sugarcane bagasse (2.5 million ton/year) are major crop residues in surplus amounts (Al-Asfour, 2009). Locally produced feeds are not sufficient to meet the nutritional requirements of livestock in Egypt (Abou-Akkada, 1988). Encouraging results obtained from using by-products in animal diets could help in reducing the shortage of animal feeds and subsequently increase milk and meat production. However, the nutritive value of the agricultural by-products like rice straw and sugarcane bagasse can be enhanced through their biological treatment and this way they can play an important role to meet nutrient requirements of the animals.

According to an estimate 13.0 million tons of total digestible nutrients (TDN) are required per year in Egypt, but only 9.6 million tons are annually produced providing 75% of the livestock energy requirements (Agriculture Economic and Statistics Institute, 2008). As a solution to overcome the shortage of animal feeds, scientists have suggested the use of ammonia and urea to increase the crude protein contents of the poor quality roughages to improve their nutrients digstibilities (Fouad *et al.,* 1998). Biological treatments using some fungi (El-Ashry *et al.,* 1997 and Khorshed, 2000) were tested to improve the nutritive value and digestibility of poor quality roughages. El-Ashry *et al.,* (2003) showed that enzymatic hydrolysis by fungi and the biological conversion of cellulosic materials improve the nutritive value of residues especially crude protein and crude fiber. Keeping in view these findings the present study was designed to study the effect of biological treatment on improvement of sugarcane bagasse nutritive value and its effect on productive performance of lactating buffaloes.

MATERIALS AND METHODS

The fungal strain *Trichoderma harzianum* F-416 and yeast strain *Saccharomyces cerevisiae* were obtained from the Microbial Chemistry Department, National Research Center, Dokki, Cairo, Egypt. Inoculums were incubated in one liter conical flask, in 500 ml medium containing 10.0 $(NH_4)_2SO_4$, 5.0 peptone, 0.5 $MgSO_4$, 0.3 H_2O, $CaCl_2$ and 10 glucose (g/l). Flasks were sterilized, cooled and inoculated with 3 days in old slant of *Trichoderma harzianum (T. harzianum)*. The microorganisms were maintained on agar medium composed of (g/l) yeast extract, 3.0; malt extract, 30; peptone, 5.0; sucrose 20 and agar 20. Then incubated at (30 °C) in rotary shaker 150 rpm for 48 hrs. These inoculums were used to inoculate 50 liters fermentor containing 40 liters of sterilized medium containing the composition of the same above mentioned medium by 10% (v/v) then incubated for 72 hrs. to produce 480 gm fungal biomass. The fungal cultures were used for enrichment of the experimental sugarcane bagasse for a period of 30 days. Samples of the treated material were taken every ten days for chemical analyses to follow the progress of the fermentation process. Concentrate feed mixture, rice straw and treated or non-treated sugarcane bagasse were chemically analyzed according to A.O.A.C (1990) method. Neutral detergent fiber (NDF), acid detergent fiber (ADF) and acid detergent lignin (ADL) were determined by the methods of Van Soest (1982).

Four rations were formulated:

T1: Sugarcane bagasse (SCB) untreated (*ad. Libtum*) + (CFM) (control).

T2: SCB treated with *T. harzianum* + CFM.

T3: SCB treated with *Saccharomyces cerevisiae* + CFM.

T4: SCB treated with *T. harzianum* + *Saccharomyces cerevisiae* + CFM.

A digestibility trial was conducted using twelve mature local Ossimi breed rams (3 animals each) weighing on average 50 kg and 3 years old. Animals were housed into individual metabolic cages for 42 days (35 days as a preliminary period followed by 7 days as collection period), to determine the digestibility coefficients and nutritive value of the three tested rations. Average feed consumed per animal per day (as fed) was calculated as 790g concentrate + 485g roughage during the preliminary period and 660g concentrate and 480g roughage during the collection period. At the end of the collection period, feces samples of each ram were mixed well and kept in the refrigerator for subsequent chemical analysis. Rumen liquor samples were taken from each animal at the end of collection period at 4 hours after feeding by a rubber stomach tube. Rumen liquor pH was measured by pH meter (Orin-Res-EARH, model 30) and ammonia nitrogen (NH_3-N) was immediately determined by the micro-diffusion method (Conway, 1963). Frozen rumen liquor samples were analyzed for total volatile fatty acids (TVFA's) by steam distillation (Abou-Akkada and Osman, 1967). Chemical composition of feeds, feces and urine were determined according to A.O.A.C (1990) method. Neutral detergent fiber (NDF), acid detergent fiber (ADF) and acid detergent lignin (ADL) were determined by the methods of Van Soest (1982).

\Sixteen lactating buffaloes weighing on an average 570 ± 15kg were allotted randomly into Four groups (four animals each) according to their milk yield. Animals were kept tied in door house. Nutrient requirements for the experimental animals were calculated according to Ghoneim (1967). Feed offered twice a day at 8 a.m. and 3 p.m. individually, while water was offered *ad lib*. Milk yield was recorded daily. Representative milk samples were taken once biweekly from each animal, from morning and evening milking of the same day. The samples were composed and analyzed for total solids (TS), fat and total protein (TP) according to Ling (1963). Blood samples were drawn from the jugular vein and centrifuged for 20 min at 3000 r.p.m. The supernatant was frozen and stored at -20°C for subsequent analysis. Plasma total protein was determined according to Armstrong and Carr (1964); albumin according to Doumas *et al., (*1971); GOT and GPT according to Reitman and Frankel (1957); creatinine according to Folin (1994) and urea according to Siest *et al.*, (1981).

The data were statistically analyzed according to Snedecor and Cochran (1980) using SAS (1985). The difference between means was tested by Duncan's multiple range test (Duncan, 1955).

RESULTS AND DISCUSSION

Chemical composition:

The results showed that, the Dry matter (DM), organic matter (OM), crude fiber (CF) and NFE contents of the sugarcane bagasse, treated with biological substances were lower than untreated sugarcane bagasse (Table, 1). While CP and Ash contents were higher than the control. The improvement of CP content could be attributed to fungus growth on the produced celluloytic enzymes by the fungal enzymatic (El-Ashry *et al.,* 2002). While, the increase of ash on all treatments was the reflection of the decrease in OM. The fiber fractions (NDF, ADF and ADL) were different in all treatments. Sugarcane bagasse like other crop or agro-industrial wastes is characterized by low crude protein content, high indigestible crude fiber and low palatability (Church, 1980). Gado (1997) studied the effect of supplementing different concentration of cellulose enzymes to bagasse silages on their chemical composition and reported that, the effect of the additional different concentration of cellulose enzymes were almost similar on OM, CP, CF and EE but, it indicated slight decrease for mentioned components. On the other hand, the degradation various fiber fractions of bagasse increased during the ensiling period with the increasing level of cellulose. Similar results have been reported by Bilal (2008) indicating reduced contents of ADF and NDF in Mott grass silage with the use of different feed additives at different levels. Biological treatment of sugarcane bagasse reduced ($P<0.05$) NDF, ADF and ADL compared with the untreated sugarcane bagasse. These results might be due to the break down of lignocellulose bonds where the cellulose can be hydrolyzed by fungi (El-Ashry *et al.,* 2002). McCarthy *et al.* (1986) reported that fungus have a similar degrade mechanism, as they degrade celluloseand hemicellulose by oxidize and solublize the lignin component. Baraghit *et al.* (2009) found an increased CP and decreased CF in sheep fed basal diet treated with many biological treatments on sugarcane bagasse. El-Ashry *et al.* (2002) noticed that *T. viride* and *Saccharomyces cerevisiae* increased the CP and decreased the CF and fiber fractions of low roughages.

Table (1): Chemical composition (% on DM basis) of untreated and treated sugarcane bagasse and concentrate feed mixture.

Item	T1	T2	T3	T4	CFM*
DM	90.05	88.15	89.20	87.02	88.80
OM	90.90	86.65	84.20	82.02	87.34
CP	3.74	6.78	5.40	9.30	14.20
CF	45.9	38.35	40.12	31.50	13.04
EE	2.90	1.75	2.07	1.54	3.24
NFE	46.36	39.77	36.61	39.68	56.86
Ash	9.10	13.35	15.8	17.98	12.66
NDF	73.40	65.02	68.10	61.15	32.75
ADF	60.60	51.54	53.51	50.20	10.46
ADL	14.88	11.62	12.10	10.80	3.48
Hemicellulose	12.80	13.66	14.59	10.95	6.98
Cellulose	45.72	39.92	41.41	39.40	22.29

* *Concentrate feed mixture (CFM) consisted of: 33% ground yellow corn, 27% undecorticated cotton seed meal, 7% soybean meal, 13% wheat bran, 12% rice bran, 5% cane molasses, 2% lime stone and 1% common salt.*

Dhanda *et al.*, (1994) used fermented wheat straw with white rot fungi and noticed that, the CP content of spent straw increased from 3.42 to 6.18% and OM was decreased as a result of the fungal treatment. Chawla and Kundu (1985) showed that treating wheat straw with some strains of fungi supplemented with urea and ammonium sulfate mixture reduced the content of NDF, ADF, ADL and hemicellulose by 19.21, 15.26, 52.62 and 41.20%, respectively with a significant increase in crude protein. Baraghit *et al.* (2009) reported that, which treated sugarcane bagasse with bacteria to improve the chemical composition and fiber fraction.

Digestibility coefficients:

As shown in Table (2), biological treatments recorded ($P<0.05$) the highest digestibility coefficients for all nutrients and nutritive value compared with control. In the mean time treated sugarcane bagasse with (*T. harzianum* + *S. cerevisiae)* was ($P<0.05$) better in all nutrients digestibility coefficients, fiber fractions digestibility and nutritive value compared with treated *T. harzianum* and treated *S. cerevisiae*. This remarkably improves in all nutrients digestibility in rations contained biologically treated sugarcane bagasse compared with the control. So, it could be attributed to the effect of biological treatment by *Trichoderma* fungi in up grading and positive alteration of the chemical composition of sugarcane bagasse. These positive results could be also supported by the earlier investigations in using even raw sugarcane bagasse in small or large ruminant's rations, which recorded positive impact in improving its digestibility coefficients of DM, OM, CP, CF, EE, NFE and the nutritive value (El-Badawi *et al.*, 2003; Gado, 1997 Gado and Abd El-Galil, 2009). El-Ashry *et al.* (2002); Mahrous *et al.*, (2005) and Baraghit *et al.* (2009) reported that biological treatments with different fungal and bacteria strain decreased cell wall constituents of different crop residue. Also, El-Ashry *et al.*, (1997) found that, TDN content increased from 63.93 and 63.35% in untreated rice straw and corn stalk to 72.31 and 72.88% in fungal treated ones, respectively.

Table (2): Effect of biological treatments on digestibility coefficients and nutritive value.

Item	Experimental groups				
	T1	T2	T3	T4	±SE
Digestibility coefficients (%):					
DM	68.84^{d}	77.10^{b}	70.56^{c}	81.40^{a}	0.74
OM	70.20^{d}	75.30^{b}	72.45^{c}	81.26^{a}	0.80
CP	65.20^{d}	74.90^{b}	72.50^{c}	76.45^{a}	0.99
CF	66.05^{d}	73.40^{b}	71.12^{c}	80.80^{a}	0.51
EE	80.20^{d}	85.32^{b}	83.40^{c}	88.27^{a}	0.32
NFE	66.70^{d}	76.5 4^{b}	70.30^{c}	80.40^{a}	0.59
NDF	40.44^{d}	51.02^{b}	46.20^{c}	55.89^{a}	0.34
ADF	38.95^{d}	45.35^{b}	41.10^{c}	48.78^{a}	0.39
ADL	10.20^{d}	15.24^{b}	12.58^{c}	17.90^{a}	0.72
Cellulose	56.70^{d}	62.44^{b}	60.41^{c}	71.70^{a}	0.26
Hemicellulose	58.90^{d}	64.38^{b}	60.80^{c}	68.60^{a}	0.49
Nutritive value (%):					
TDN	50.65^{d}	60.8^{b}	58.24^{c}	62.60^{a}	0.60
DCP	6.01^{d}	7.05^{b}	6.82^{c}	8.90^{a}	0.58

$^{a\,b\,c\,d}$ *means in the same row for each parameter with different superscripts are significantly different (P<0.05).*

In general, T4 recorded the best digestibility coefficients, fiber fractions digestibility and nutritive value compared to other treatments. However T2 gave better results compared to T3 and T1, respectively. This may be due to that fungi increased number of cellulalytic bacteria as indicated previously by Wiedmeier *et al.* (1987) or the increase in cells in fermentation capacity of the rumen (Hungate, 1975) or that presence of fungi cells in the rumen might initiate a dynamic action that out come faster passage rate of feed particles in the gastro intestinal tract (El-Badawi *et al.*, 2003).

Rumen fermentation:

Results in Table (3) revealed insignificant differences among T1, T2, T3 and T4 in the values of rumen pH. These results are in disagreement with Baraghit *et al.* (2009) who reported that pH values were higher before feeding and decline after feeding to reach the least value at 4 hours and then it started to rise up at 6 hours. While NH_3-N concentration and TVFA's concentration were significantly different with all biological treatments compared with the control (T1). On the other hand, T4 recorded ($P<0.05$) higher NH_3-N and TVFA's concentration compared with all other treatments (T1, T2 and T3). Yadav and Yadav (1988) noticed that increased ruminal NH_3-N concentration might be due to the higher intake of nitrogen and higher CP digestibility. This improvement in TVFA's concentration in T4 may be attributed to alteration in chemical composition of sugarcane bagasse by the biological treatment by *T. harzianum* + *S. cerevisiae*. Kumar *et al.* (1997) found high concentration of TVFA's in the rumen fluid when used biologically treated roughages, they attributed such increase to the high fiber breakdown.

Table (3): Effect of biological treatments on rumen parameters.

Item	Time (hrs.)	Experimental groups				±SE
		T1	T2	T3	T4	
pH	0	5.70	5.80	5.70	5.60	0.05
	3	5.54	5.52	5.48	5.50	0.03
	6	5.05	5.04	5.09	5.07	0.04
NH_3-N (mg/100ml)	0	9.06^{d}	10.65^{b}	9.51^{c}	12.56^{a}	1.20
	3	12.85^{d}	18.02^{b}	15.89^{c}	19.53^{a}	1.30
	6	10.44^{d}	14.57^{b}	12.70^{c}	16.80^{a}	0.89
TVFA's (meq. /100ml)	0	9.80^{d}	11.43^{b}	13.00^{c}	15.90^{a}	0.32
	3	15.25^{d}	18.49^{b}	16.99^{c}	20.38^{a}	0.41
	6	12.20^{d}	15.81^{b}	14.30^{c}	17.13^{a}	0.50

a b c d means in the same row for each parameter with different superscripts are significantly different ($P<0.05$).

Khorshed (2000) and Abd El-Galil (2000 and 2006) found that the highest ammonia-N concentration after 4 hrs of feeding. These differences in NH_3-N concentration are referred to difference in treatments. However, it is well recognized that the NH_3-N concentration found in the rumen at any given time presented the net concentration value of its production, utilization by rumen microbs and absorption across the rumen wall, the dilution by other factors and passage to the lower gut. These results are in agreement with that of Mahrous *et al.*, (2009). Similar results are also reported by El-Ashry *et al.*, (1997) and Khorshed (2000) that NH_3-N concentration increased in rumen of sheep and goats fed on ration treated with white rot fungi or yeast culture. NH_3-N and VFA values were significant ($P<0.05$) only at 4 and 6 hrs post feeding. The NH_3-N and VFA increased ($P<0.05$) in the biological treatment SCB compared with untreated SCB (control) (Baraghit *et al.*, 2009).

It is worthy to notice that the balance between NH_3-N and TVFA's concentrations reflect the pH values in the rumen liquor. These results might be related to the more utilization of the dietary energy and positive fermentation in the rumen.

Blood constituents:

Blood parameters presented in Table (4) revealed that there were no deleterious effects of T2, T3, T4 of either treated or untreated SCB. No significant differences among tested rations were recorded for blood plasma total protein, albumin, globulin, creatinine, GOT and GPT. While great differences were recorded for blood urea concentration with feeding SCB. All parameters were found to be within the normal range as reported by Kaneko *et al.* (1997). These results of blood metabolism are in agreement with those reported by El-Shaer (2003).

Table (4): Effect of biological treatments on blood parameters for buffaloes.

Item	Experimental groups				±SE
	T1	T2	T3	T4	
Total protein (g/dl)	9.90	10.50	10.38	10.45	0.90
Albumin (g/dl)	7.20	7.50	7.50	7.53	0.67
Globulin (g/dl)	2.70	2.99	2.80	2.90	0.78
Urea (mg/dl)	30.40^{d}	39.30^{b}	35.80^{c}	44.50^{a}	0.86
Cereatinine (mg/dl)	1.40	1.30	1.35	1.38	0.10
GOT (U/I)	11.50	11.60	12.40	12.04	0.67
GPT (U/I)	18.40	17.70	18.60	18.00	0.28

a b c d means in the same row for each parameter with different superscripts are significantly different (P<0.05).

Cornelius (1970) reported that the concentration of the total protein in serum of domestic animals ranged between 6-10g/dl serum. Gomma *et al.* (1989) reported that protein fractions presented as albumin and globulin and blood urea-N were higher in lambs fed ration contained treated straw with 5% urea than in those fed untreated roughage. Deraz (1996) reported that the highest value of total proteins, albumin, urea-N, GOT and GPT were recorded with rams fed ration contained corn stalks treated with chemi-fungal followed by rations treated with urea and untreated. El-Ashry *et al.* (1997) reported that the higher values of total protein, urea-N and GOT were obtained with rams fed ration containing chemi-fungal treated roughaj These results are in disagreement with Khorshed (2000) who indicated that values of seru total protein of ration contained biological treatment were higher than the value of the contr The same trend was observed with albumin, globulin, urea-N, GOT and GPT. On the other han Ahmed *et al.* (1999) found that substituting 50 or 100% yellow corn in the concentrate mixtu of Friesian calves diets by date seeds had significant effect on serum total protein, albumin ar urea but insignificant on globulin and albumin/globulin ratio.

Milk composition:

Milk yield and its composition are shown in Table (5). Analysis of variance showe insignificant differences (P>0.05) among the control group and the groups fed biologicall treated sugarcane bagasse in the average daily milk yield. However, T4, T2 and T3 were foun to have slightly higher milk yield compared with T1 (control), respectively. The same trend (insignificancy was observed among the four tested groups in fat, protein, lactose total soli percentages. However T1 was slightly lower in total solids compared with T4, T2 and T3. In th mean time T4, T2 and T3 were slightly higher in fat, protein and lactose content compared wit T1. Mahgoub (2001) in a study on replacing 30% of concentrate feed mixture by sugarcar bagasse or 30 or 60% mixture of sugarcane bagasse + poultry droppings silage on lactatin buffaloes reported that groups showed insignificant difference in average daily milk yield kg, fa corrected milk, protein, lactose and ash percentages compared with the control. Results obtaine by Sabbah *et al.* (1997) were found to be in agreement with the results obtained in this currer study.

Table (5): Effect of biological treatments on milk yield and milk contents for buffaloes.

Item	Experimental groups				±SE
	T1	T2	T3	T4	
Milk yield kg/h/d	6.50	6.70	6.60	7.10	0.10
Fat %	6.34	6.55	6.45	6.81	0.17
Protein %	4.25	4.43	4.35	4.50	0.16
Lactose %	5.20	5.50	5.30	5.60	0.15
Total solid %	16.90	17.30	17.10	17.50	0.74

Feed and economic efficiency:

As given in Table (6), dry matter intake for groups fed SCB (T2, T3 and T4) was found to be less than that of the control fed group (T1), respectively. In contrary, Deraz (1996) found that chemical and biological treatments increased markedly voluntary DM intake of corn stalks of growing lambs by 63.3 and 33.8%, respectively, when compared with mechanically treated corn stalks.

Feed efficiency as kg DMI/kg milk produced (Table 6) was found to be decreased as the level of incorporation SCB in the ration which increased by 18.02, 9.30 and 25.58% compared with the control, respectively. These findings could be attributed to high milk yield as well as low dry matter intake recorded by T2, T3 and T4 compared with the control (T1). In contrary, each kg TDN and DCP/kg milk was found to be increased as the level of incorporation SCB in the ration increased. These findings could be attributed to the high content of DCP and TDN in T2, T3 and T4 as shown in Table (2). These results are in agreement with results reported earlier by (Sabbah *et al.*, 1997 and Mahgoub, 2001) observed that replacing 40% of the concentrate feed mixture by biologically treated rice straw reduced the cost of feeding by 28.8%. .

Table (6): Feed consumption, feed efficiency and economic evaluation of tested rations.

Item	Experimental groups			
	T1	T2	T3	T4
No. of animal	4	4	4	4
Feed intake, kg DM/h/d				
CFM	5.90	4.21	5.00	3.80
SCB	5.30	5.30	5.30	5.30
Total DMI, kg	11.20	9.51	10.30	9.10
Feed efficiency				
Kg DMI/kg milk	1.72	1.41	1.56	1.28
Kg TDN/kg milk	0.77	0.90	0.88	0.88
Kg DCP//kg milk	0.09	0.10	0.10	0.12
Economical evaluation:				
Total feed cost, LE/h/d	6.80	5.90	6.53	5.60
Feed cost, LE/kg milk yield	1.04	0.88	0.98	0.78

CONCLUSION

In general, it can be concluded that (*T. harzianum* + *S. cerevisiae)* as a biological treatment had a great effect on degrading the crude fiber content and increasing crude protein, protein digestibility, fiber fractions digestibility of bagasse. In addition, biological treatments as a result of molecular biology are preferable in terms of being a biological treatment, rather than the other treatments, such as chemical and physical treatments, for better and clear environment.

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تاثير المعاملة البيولوجية على تحسين القيمة الغذائية لمصاصة قصب السكر وتاثيرها على الاداء الانتاجى للجاموس الحلاب

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تهدف هذه التجربة الى دراسة مدى تأثير المعاملة البيولوجية على تحسين القيمة الغذائية لمصاصة القصب و مردود ذلك على الاداء الانتاجى للجاموس الحلاب. و لذلك تم استخدم ١٦ جاموسة حلابة بمتوسط وزن ٥٧٠ ±١٥ كيلوجرام قسمت بشكل عشوائي إلى أربعة مجموعات تجريبية (أربعة حيوانات فى كل مجموعة). حيث تغذت حيوانات المجموعة الاولى على مصاصة قصب غير معامل *(ad lib.)* + العلف المركز بنسبة ٣% من وزن الحيوان الحى، المجموعة الثانية على مصاصة قصب معامل بفطر *Trichoderma harzianum* + العلف المركز، المجموعة الثالثة على مصاصة قصب معامل بخميرة *Saccharomyces cerevisiae* + العلف المركز و المجموعة الرابعة على مصاصة قصب معامل بـ (*Trichoderma harzianum + Saccharomyces cerevisiae*) + العلف المركز. تم أجراء تجربة هضم باستخدام ١٢ كبش اوسيمى تام النمو. واوضحت النتائج ان المعاملة البيولوجية كانت ذات معاملات هضم اعلى (عند مستوى ٥%) لكل المواد المهضومة والقيمة الغذائية مقارنة بمجموعة الكنترول (المجموعة الاولى). و فى ذات الوقت كانت المجموعة الرابعة افضل فى معاملات الهضم للمواد الغذائية وايضا لمكونات الالياف والقيمة الغذائية عن المجموعتين الثانية والثالثة. كما سجلت المعاملات البيولوجية كفاءة غذائية افضل (المأكول من المادة الجافة كجم / كجم لبن) على النحو التالى ١٨,٠٢و ٩,٣٠ و ٢٥,٥٨% على التوالى مقارنة بمجموعة المقارنة.

يستخلص من هذا البحث بانه يمكن الاستفادة من مخلفات قصب السكر و التى تعد أحد مصادر تلوث البيئة و ذلك برفع قيمتها الغذائية عن طريق المعاملات البيولوجية. فقد أمكن استخدامها بنجاح فى تغذية الجاموس الحلاب بما قد يساهم فى التغلب على مشكلة تغذية الحيوانات والاستفادة من المخلفات الزراعية مع الحفاظ على نظافة البيئة.