Improving Corn Cobs Utilization In Sheep Ration Using Biological Treatment

Salama, R[1].; R.I. El-Kady [2]; M.I. Mohamed [2],; M.A. Boraie [1] and S.A.E.Abd-Allah [2]

1- **Animal Production Department, Faculty of Agriculture, Al-Azhar University, Nasr City, Cairo, Egypt**
2- **Department of Animal Production, National Research Center, Dokki, Giza, Egypt.**

ABSTRACT

The main objectives of the present experiment were to investigate the effect of biological treatment (fungus + yeast) on chemical composition and utilizability of treated (corn cobs) in sheep ration. Twenty growing cross bred (Rahmani × Ossimi) male lambs of 4 months old and mean body weight 28 kg were distributed into four similar groups. The treated corn cobs were to replace 0, 10, 20 or 30% of Berseem hay included in the feed mixture fed to growing lamb groups R_1, R_2, R_3 and R_4, respectively. The experimental period lasted for 90 days. Feed mixtures were offered daily at 3% of live body weight and groundnut vines were *ad-lib*.Results indicated that, the average body weight gain, feed intake and feed efficiency differed significantly higher for sheep fed R_4 followed by R_3. However, no significant differences were detected between R_2 and the control ration. Feed efficiency values were significantly between groups and the highest values were recorded with R_4 and R_3. Digestibilities of DM, OM, CP and EE were significantly different among groups. The highest values were recorded for R_4 ration of almost nutrients. Concentration of ammonia-nitrogen (NH_3-N) and total volatile fatty acids at 3 hrs post feeding were significantly higher in treated groups than that of control one. However, the least feed cost/kg gain was that of treatment (R4) followed by (R3) than the control.

The biological treatments applied in the present study could be used without any adverse effect on the tested hemato–biochemical parameters. It could be concluded that replacement up to 30% of Berseem hay by biological treated corn cobs improved the productive performance of growing lambs.

Key words: Biological treatments, Sheep, Digestibility, Rumen liquor parameters, Blood parameters.

INTRODUCTION

There is an urgent need to search for more available and cheaper roughage, particularly agricultural by-products as corn cobs for animal feeding, because there is a gap between animal requirements and the available animal's feed, so biological treatments are preferable than other treatments such chemical treatment for better and clear environment. Residues are burned or wasted and hence lead to environmental pollution and consequently health hazards. The primary factors limiting the utilization of crop residues are low digestibility, low protein content and low platability. Biological treatments such as *Trichoderma viride* (Shoukry,et al., 1985., Khorshed,2000 and El-Ashry *et al.*, 2003) were used to improve the nutritive value and digestibility of poor quality roughages. Increasing the digestibility of the diet by using exogenous feed enzymes obtained from fungal treatment will be lead to the beneficial effects on animal performance, also yeast treatment was used to improve rumen digestibility of nutrients especially crude fiber, elevation rumen fermentation and more activation of rumen microorganisms (Dawson, 1992).

This study aimed to investigate the ability of biological treatment (fungi and yeast) to improve nutritive value as total digestible nutrient (TDN) and digestible crude protein (DCP) of corn cobs as crop residues and the effect of biological treatments of corn cobs on nutrient digestibility, rumen fermentation and economical study on growing sheep ration.

MATERIALS AND METHODS

This study was carried out at Sheep and Goat Research Unit that belong to Animal Production Department at National Research Center, Dokki, Giza. *Trichoderma reesei F-418* and *Saccharomyces cervisiae AFZ-98* were obtained from Microbial Chemistry Department, National Research Centre, Dokki, Egypt.

Biological treatment:

Trichoderma reesei F-418 and *Saccharomyces cervisiae AFZ-98* were propagated for biological treatment according to the method described by Fadel (2001). The crushed corn cobs (150 kg) were moistened by a medium containing urea 2%, ammonium sulphate 1.0%, magnesium sulphate 0.5%, tricalcium phosphate 1.0% and molasses 2% at a ratio of solid: liquid (1:2), then inoculated by prepared fungal inoculum at 10% (w/w). Yeast inoculum at 1% (w/w) was added after (48 hrs) from fermentation being the treatment was continued for ten days. At the end of fermentation period, the tested materials were manual mixing at intervals (48 hrs) and exposed to sun dry until the moisture content reached less than 10%, then stored until be used.

Composting producers and combined fungal and yeast treatment of corn cobs:

One ton from the previous crushed corn cobs mention before was moistened with a medium contained 25 kg molasses, 15 kg urea of 46.5%N 10 kg super phosphate, 20 kg ammonium sulphate 20.6% N and 5 Kg magnesium sulphate at solid: liquid ratio (1: 2). The inoculum of fermented fungal biomass and growing yeast culture were used at 0.1% (w/w), mixed well and spread on plastic sheet (2 x 5 m), corn cobs treated were shuffled up side down daily for 10 days. At the end of the fermentation period, the treated corn cobs were collected and exposed to sun dry until the moisture content reached less than 10% then packed and stored until be used.

Manufacturing the pelleted rations and animal feeding:

The air dried corn cobs have been transported to the manufacture for making the experimental pelleted feed. All ingredients of each ration were mixed well. Substitution of Berseem hay with biologically treated corn cobs (T.C.C.) with mixture of fungi and yeast (50% of each) at a rate of 10%, 20% and 30% (complete substitution) of Berseem hay with treated corn cobs.

Formulation and chemical composition of the experimental rations as follows:

1) The 1st mixture contained (0% corn cobs biologically treated+30% Berseem hay). (R_1).
2) The 2nd mixture contained (10% corn cobs biologically treated +20% Berseem hay). (R_2).
3) The 3rd mixture contained (20% corn cobs biologically treated +10%Berseem hay). (R_3).
4) The 4th mixture contained (30% corn cobs biologically treated +0% Berseem hay).(R_4)

All rations were nearly isocaloric and isonitrogenous. Formulation and chemical composition of the experimental concentrate feed mixture, treated corn cobs and groundnut vines are presented in Tables (1 and 2).

In this regard, twenty growing crossbred (Rahmani × Ossimi) male lambs 4 months old (averaged 28.0 kg) were divided into 4 similar groups (each group of 5 lambs). The growth trials lasted for 90 days, each group was kept in a separate shaded pen and randomly offered tested rations. The experimental feed mixtures were offered at 3% of live body weight and groundnut vines were offered *ad-lib*. Feed was group feeding two times daily at 8 a.m. and at 5 p.m., while feed residues were removed and weighed once daily before morning feeding to estimate daily feed intake. Fresh water and mineral blocks were freely available all times. Lamb weights were recorded at the beginning of the experiment and thereafter at biweekly intervals till the end of the experiment. Feeding rations of the experimental lambs were changed every 2 weeks according to body weight changes.

At the end of the experiment, four digestibility trials were carried out by using 3 animals, chosen randomly from each experimental group to determine nutrients digestibility and nutritive values of the experimental rations. Animals were kept in metabolic cages for 14 days before sample collection. Feces were collected daily during the collection period extended for 5 days, weighed and representative samples (10% of weight) were taken. Animals were fed their rations as described above and the residual was collected and weighted daily. Animals were allowed free access to water.

Rumen liquor :

Rumen liquor samples were collected at 0, 3 and 6 hours after the morning feeding from 3 lambs of each group during the feeding trial using stomach tube. Samples were filtered through a double layer of cheesecloth. Ruminal pH value was immediately estimated using Orion 680 digital pH meter. Few drops of a saturated solution of mercuric chloride were used to stop microbial activity and the samples were stored in polyethylene bottles in a freezer until analysis. Concentration of TVFA's was determined using steam distillation method (Warner, 1964). The concentration of ammonia-N, feed and feces were analyzed according to AOAC (1995) methods. Data were subjected to statistical analysis using SAS (1989) with one way ANOVA while differences among means were tested using L S D (Duncan, 1955).

Blood profile:

Blood samples were collected from the jugular vein before feeding (0 time) from five lambs of each group once at end of the experiment. Whole blood was immediately used for hematological estimations. Another blood sample was directly collected into a clean dried tube and centrifuged at 4000 r.p.m. for 20 min. then the blood serum was separated into a clean dried glass vial and stored at -18^{o}C to determine serum total protein (Armestrong and Carr, 1964), albumin (Doumas *et al.,* 1971), AST and ALT (Reitman and Frankel, 1957), urea (Patton and Crouch, 1977), creatinine (Husdan, 1968), glucose (Siest *et al.,* 1981), total lipids (Postma and Stroes, 1968) and cholesterol (Raltiff and Hall, 1973). globulin and albumin/globulin ratio were calculated.

Feed conversion and economic efficiencies:

Feed conversion was calculated as the amount of DM and TDN (Kg) required per Kg live body weight gain. Economic efficiency expressed as the daily feed cost, price of daily weight gain, feed cost per Kg gain and the ratio between daily feed cost and price of daily weight gain. The prices in Egyptian pounds (LE/ton) were 200 Corn Cobs, 700 Berseem hay and 17 for one kg live weight gain.

Results and Discussion

The composition of different experimental rations are presented in table (1), while the chemical composition of the experimental rations are presented in table (2). The data showed nearly isocaloric and isonitrogenous for different experimental rations.

Table (1): Composition for experimental rations (Kg/100Kg).

Ingredient	Experimental rations			
	0% T.C.C. (R_1)	**10% T.C.C. (R_2)**	**20% T.C.C. (R_3)**	**30% T.C.C.* (R_4)**
Yellow corn	35.0	35.0	35.0	35.0
Treated corn cobs	--	10	20	30
Berseem hay	30	20	10	--
Undecorticatd cottonseed meal	10	10	10	10
Soybean meal (44%)	8	8	8	8
Wheat bran	10	10	10	10
Molasses	4	4	4	4
Calcium carbonate	1.8	1.8	1.8	1.8
Sodium chloride (NaCl)	1.0	1.0	1.0	1.0
Minerals and vitamins	0.2	0.2	0.2	0.2

***** T.C.**C :** Biological treated corn cobs.

Table (2): Chemical composition of concentrate feed mixture, treated corn cobs and groundnut vines.

Item	DM	Chemical composition % on DM basis					
		OM	**CP**	**CF**	**EE**	**NFE**	**Ash**
0% T.C.C. (R_1)	90.84	94.52	14.07	14.20	3.39	62.86	5.48
10% T.C.C. (R_2)	91.30	94.67	14.50	14.42	3.26	62.49	5.33
20% T.C.C. (R_3)	91.22	94.59	14.30	14.55	3.08	62.66	5.41
30% T.C.C. (R_4)	91.13	95.90	14.35	14.90	2.93	63.72	4.10
Treated corn cobs	90.53	94.77	14.82	31.43	1.03	47.49	5.23
Groundnut vines hay	88.43	87.35	10.09	30.12	2.79	44.35	12.65

Growth performance:

The average body weight gain, feed intake and feed conversion are given in Table (3). Average daily weight gain was significantly higher for sheep fed R_4 followed by R_3 ration. However, no significant difference was detected between R_2 and the control one in daily weight gain. Data showed that inclusion treated corn cobs up to (30%) in R_4 ration recorded the highest average daily weight gain followed by R_3. However, R_2 (10% treated corn cobs) did not increase the beneficial effects of the fungal +yeast preparation used in daily body weight gain. Similar results were reported by Deraz (1996) and El-Kady *et al.* (2006).

Total dry matter intake (TDMI) slightly increased with R_4, R_3 and R_2 compared to(control) R_1. These results of DMI with fungal treatment agreed with those obtained by Beaychemin *et al.* (1999); Rode *et al.* (1999) and Yang *et al.* (1999). However Bouattour(2004), Flores (2004); Gonzilez (2004), Titi (2004); and El-Kady *et al.* (2006) reported that fungal or enzymatic treatments obtained from fungal did not alter dry matter intake. In contrast, others have reported increased feed intake (Lewis *et al.*, 1999 and Mc Allister *et al.*, 1999).Total digestible nutrients as TDN , g or TDN Kg $w^{0.75}$ and digestible crude protein (DCP) g / h / d or DCP g/ Kg $w^{0.75}$ were significantly higher for sheep fed R_4 than other treatments.

Feed conversion as Kg dry mater intake/kg gain and as kg TDN/Kg gain were significantly differ among groups, and the best values were recorded with R_4 and R_3,while there was no significant difference in feed conversion between R_2 and the control rations. The improvement in TDN/gain of biologically treatment might due to the improvement of digestibility. Similar results were obtained by Plata-Perez *et al.*, (2004); Titi (2004);Haddad and Goussous (2005) and El-Kady *et al.*, (2006) who found that exogenous fibrolylic enzymes obtained from *Trichoderma viride* resulted in improved ($P< 0.05$) feed conversion ratio and daily gain of fattened Awassi lambs with no effect on feed intake. Results indicated that fibrolytic enzymes could enhance the growth of fattened lambs and improve their conversion ratios mainly through improving digestibility.

Table (3): Effect of the experimental rations on growth performance of growing lambs.

Items	R_1	R_2	R_3	R_4
Initial live body weight (I.B.W.), Kg	28	28	28	28
Final live body weight (F.B.W.), Kg	$49.6^{c}\pm$ 0.859	$49.8^{c}\pm$ 0.973	$51.9^{b}\pm$ 1.138	$52.8^{a}\pm$ 0.937
Total body gain, Kg	$21.6^{c}\pm$ 1.167	$21.8^{c}\pm$ 1.189	$23.9^{b}\pm$ 1.393	$24.8^{a}\pm$ 2.053
Av. daily body gain, g	$240^{c}\pm$ 11.847	$242^{c}\pm$ 14.692	$266^{b}\pm$ 8.083	$276^{a}\pm$ 9.203
DM intake, g /h /d				
Feed mixture	1057	1065	1064	1066
Roughage	570	580	580	600
Total dry matter intake (TDMI) g	1627	1645	1644	1666
TDN, g / h /d	1144.59^{b} ±0.610	1159.72^{b} ±0.44	1184.83^{b} ±0.350	1244.17^{a} ±0.404
TDN kg w^{0-75}	$73.60^{b}\pm$ 0.450	$74.48^{b}\pm$ 0.379	$74.56^{b}\pm$ 0.430	$77.66^{a}\pm$ 0.404
Digestible crude protein (DCP) g/h/d	$145.13^{b}\pm$ 0.233	146.73^{b} ±0.395	144.50^{b} ±0.067	165.60^{a} ±0.050
DCP, g/Kg w^{0-75}	$9.33^{b}\pm$ 0.337	$9.42^{b}\pm$ 0.323	$9.090^{b}\pm$ 0.20	$10.33^{a}\pm$ 0.082
Feed conversion DMI Kg/Kg gain	$6.78^{a}\pm$ 0.125	$6.79^{a}\pm$ 0.184	$6.18^{b}\pm$ 0.152	$6.04^{b}\pm$ 0.133
TDN intake kg/kg gain	$4.76^{b}\pm$ 0.610	$4.79^{b}\pm$ 0.54	$4.45^{a}\pm$ 0.390	$4.51^{a}\pm$ 0.432

a,b and c : Means within a row with different superscript are significantly different at ($P\leq 0.05$).

Digestion coefficient and nutritive values:

Results of nutrient digestion coefficients and nutritive values of the experimental feed mixtures are shown in Table (4). Digestibilities of DM, OM, CP, and EE were significantly different among groups. The highest digestibility values were recorded for R_4 ration of almost nutrients. However, the CP digestibility values were nearly similar and significantly higher with R_3 and R_4 rations in comparison with R_2 and the control rations. However, no significantly differences were obtained in NFE digestibility for all tested rations. The improvement in almost nutrient digestibility of biological treatment agreed with Ward and Perry (1982) when treated corn cobs with (*Trichoderma viride*). In addition, Rai and Mudgal (1984) found that the *in-vitro* digestibility of almost nutrients were higher ($P<0.01$) in wheat straw treated with cellulase (made from *T. viride*). However, El-Ashry *et al.* (1997) observed that both chemical or biochemical (urea + *Penicillium funiculosum*) treatment of the chopped roughage improved ($P < 0.05$) ration digestibilities as DM, OM, CP and CF than the control ration, using Ossimi mature rams.

Moreover, Khorshed (2000) reported that all biological treatments (*T. viride, S. cervisial or T. viride + S. cerevisiae*) significantly increased apparent nutrient digestibilities for DM, OM, CP, CF and NFE. On the other hand, Zewil (2005) showed that almost nutrient digestibilities were improved with *Trichoderma viride* fungus treatment of sheep rations. Also, Gutierrez *et al.* (2005) reported that both amylolytic thermostable enzymes obtained from fungus treatment have the potential to become feed additives to improve ruminal digestibility of corn and sorghum, and are stable at low humidity conditions which may facilitate incorporation with grain during feed processing. Similar results were obtained also by El-Kady *et al.* (2006).

It is worthy to note that the improving of digestibility of nutrients (R_4) led to improve the nutritive value of diets. So, the treatment of corn cobs with (*Trichoderma reesi* + *S. cervisiae*) with R_4 group significantly improved the feeding values as TDN and DCP. Data showed that the dietary inclusion of treated corn cobs lower than (30%) did not improved the nutritive value of sheep rations.

Table (4): Digestion coefficients and nutritive values of the experimental rations (on DM basis).

Item	Experimental rations			
	R_1	**R_2**	**R_3**	**R_4**
No. of animal	3	3	3	3
Mean live body weight	53.66	55.33	53.30	53.60
Total DM intake, g/h/d	1567.48	1611.32	1547.80	1596.00
Feed mixture g/h/d	975.00	1010.00	973.00	977.00
Ground nut hay g/h/d	592.48	601.32	574.80	619.00
DM intake % of body weight	2.92	2.91	2.90	2.97
Apparent digestibility(%): DM	$67.81^{b}\pm$ 1.173	$66.05^{b}\pm$ 0.945	$66.98^{b}\pm$ 0.618	$70.71^{a}\pm$ 0.453
OM	$71.44^{b}\pm$ 0.661	$71.32^{b}\pm$ 0.713	$72.17^{ab}\pm$ 0.546	$75.43^{a}\pm$ 0.667
CP	$63.43^{b}\pm$ 0.892	$61.54^{b}\pm$ 0.387	$68.97^{a}\pm$ 0.642	$69.37^{a}\pm$ 1.627
CF	$58.41^{b}\pm$ 0.963	$58.80^{b}\pm$ 0.874	$60.46^{b}\pm$ 0.288	$66.69^{a}\pm$ 0.895
EE	$76.02^{b}\pm$ 0.405	$77.52^{b}\pm$ 0.455	$77.91^{b}\pm$ 0.453	$80.02^{a}\pm$ 0.486
NFE	$75.31\pm$ 0.732	$75.88\pm$ 0.354	$76.64\pm$ 0.379	$77.45\pm$ 0.332
Nutritive value, % Total digestible nutrients (TDN)	$70.35^{b}\pm$ 0.617	$70.50^{b}\pm$ 0.452	$72.07^{b}\pm$ 0.379	$74.68^{a}\pm$ 0.435
Digestible crude protein (DCP)	$8.92^{b}\pm$ 0.359	$8.92^{b}\pm$ 0.332	$8.79^{b}\pm$ 0.335	$9.94^{a}\pm$ 0.288

a and b : Means within a row with different superscript are significantly different at ($P\leq 0.05$).

Rumen liquor parameters:

The results indicated that pH values were not affected by the treatments (Table 5). Similar results were obtained by El-Ashry *et al.*(1997) who found that biological treatments (fungi or enzymes) did not affect rumen pH. Abd El-Kareem (1990) noticed that the ruminal pH values decreased gradually reaching the lowest values at 2 hrs after feeding and tended to increase again after 4 and 6 hrs. Also Tawila (1991) found that the overall mean of pH in rumen liquor of sheep before morning feeding was found to be 7.1 then decreased to 6.4 at 2 and 4 hrs after feeding and tended to increase again after 6 hrs to reach 6.7.

Ammonia-N(NH_3-N) concentration reached the maximum after 3 hours of feeding in all groups. However, NH_3-N concentrations were significantly higher ($P<0.05$) in the treated groups than the control group. After 6 hours of feeding, NH_3-N concentration tended to decrease in all groups. This agrees with the results reported by Williams and Newbold (1990). They reported that the reduction of ammonia-N in the rumen liquor appears to be the result of increased incorporation of ammonia-N into microbial protein and it was considered as a direct result to stimulated microbial activity.

Replacement of Corn cobs treated with fungus and yeast up to level of 30% (R_4) maintained the significantly highest value of ruminal TVFA's before feeding followed by R_3 and R_2, the lowest values recorded for the control group. These results agree with those obtained by Henics (1987) who found that the level of ruminal TVFA's reached to maximum at 3 hrs. after feeding for lambs fed *ad-libitum*. These results of biological treatments might be related to the more utilization of the dietary energy and positive fermentation in the rumen. On the contrary, the lowest pH values were recorded after 3 hrs of feeding for the different treatments.

Table (5): Effect of the experimental rations and sampling time on pH, ammonia (NH_3-N) and total volatile fatty acid (TVFA's) concentrations in the rumen of lambs.

Item	Time of sampling (hrs)	Experimental rations			
		R_1	R_2	R_3	R_4
pH					
	0	7.03±0.120	7.07±0.182	6.98±0.129	7.31±0.267
	3	6.66^{ab}±0.114	6.52^{b}±0.157	6.96^{ab}±0.234	7.16^{a}±0.166
	6	7.18±0.235	7.33±0.287	7.22±0.192	7.33±0.133
NH_3-N,mg/100ml					
	0	12.14±0.763	12.05±1.133	12.88±1.228	15.21±0.87
	3	16.95^{b}±0.437	23.44^{a}±1.231	24.11^{a}±2.467	25.03^{a}±0.431
	6	12.99^{c}±0.109	17.36^{b}±1.584	19.4^{ab}±1.224	21.92^{a}±1.167
TVFA's, meq/100ml					
	0	8.22^{b}±0.725	9.32^{ab}±0.451	9.53^{ab}±0.364	10.32^{a}±0.133
	3	10.23^{b}±0.546	12.95^{a}±0.419	13.59^{a}±0.474	13.76^{a}±0.385
	6	8.83±0.378	9.37±0.145	9.00±0.458	9.24±0.183

- a, b and c Means in the same row with different superscripts are significantly ($P < 0.05$) different.
- Each value is a mean of 3 samples from 3 animals.

Effect of feeding biological treated corn cobs on blood parameters:

Data of hemato-biochemical parameters are presented in Table 6. The obtained results indicated that the biological treated corn cobs at 30% replacement (R_4) had a significant higher effect on lymphocytes than that other treatments. However, the different experimental rations had nonsignificant effect on Hb, RBc's and WBc's parameters. Such effects varied from being negative to positive. Serum total protein and albumin were increased significantly ($P<0.05$) with fungal and yeast treatment (R_4) compared with the other treatments, however, serum globulin and A/G ratio were not affected by the treatments (Table 6). Serum total protein reflects the nutritional status of the animal and it has a positive correlation with dietary protein (Kumar *et al.*, 1980). These results are parallel with values of organic matter and crude protein digestibility. It is of interest to note that levels of rumen liquor ammonia-nitrogen show the same trend of serum total protein.

The results of total protein and albumin are in a good agreement with the findings of El-Ashry *et al.* (1997) and Khorshed (2000) who found that biological treatments increased serum total protein (in sheep). Also, the results of yeast treatment are in accordance with those obtained by Abo El-Nor and Kholif (1998) and Kholif *et al.* (2000). However, Piva *et al.* (1993) found that levels of blood plasma total protein were not affected adversely by added dietary yeast culture.

The results of globulin are in the line of those obtained by El-Ashry *et al.* (1997) and Khorshed (2000) (with fungal culture treatments) and Piva *et al.* (1993). Abo El-Nor and Kholif (1998) and Kholif *et al.* (2000) (with yeast treatments supplementation).

Values of serum urea were affected by the treatments (Table 6). The results are in agreement with those obtained by El-Ashry *et al.* (1997) and Khorshed (2000).who reported a significant increase in serum urea nitrogen concentration with fungal treatments. On the other hand, Abo El-Nor and Kholif (1998) and Kholif *et al.* (2000) reported significant increase in serum urea nitrogen concentration with yeast culture supplement.

Values of serum creatinine were improved by the treatment. Generally, serum creatinine level is a useful indicator of glomerular filtration in the kidney. Regarding to the results of serum urea nitrogen and serum creatinine concentrations, it is clear that the tested animals were not in a catabolism situation and kidney function was improved by the biological treatments. Consequently, the animals were in a good nutritional conditions.

Serum glucose concentrations were not affected by the treatments, however, triglycerides improved by the biological treatment compared with the control ration. The slighte increase of serum glucose with biological treatments may be due to higher OM and CF digestibilities and higher TVFA's content in rumen of animals given the treated rations.

These results are closed with the findings of Piva *et al.* (1993), they reported that plasma glucose were not affected adversely by the added dietary yeast culture. However, Abo El-Nor and Kholif (1998), Sharma *et al.*(1998) and Kholif *et al.* (2000) stated that serum glucose content increased significantly with yeast culture supplementation to buffaloes or cows rations.

Serum cholesterol recorded a significantly decreased with biological treatment compared with the control ration. However, Piva *et al.*(1993). found that plasma cholesterol was not affected by the added dietary yeast culture to cows ration. While, Kholif *et al.* (2000) reported a significant increase ($P < 0.05$) of serum cholesterol with yeast culture (Yea Sacc group) compared with the control.

The activity serum AST and serum ALT were improved by the biological treatment compared to the control ration. The results of biological treatment are in agreement with those of Abo El-Nor and Kholif (1998). While, Kholif *et al.* (2000) found that serum AST activity recorded insignificant increase ($P>0.05$) with dietary yeast culture supplement. The present values of AST and ALT showed normal activity of the animal hepatic tissues and consequently, the biological treatments applied in the present study could be used without any adverse effect on the liver function. Consequently the animals were in a good nutritional condition.

Table (6): Blood profile of sheep as affected by the experimental treatments.

Items	R_1	R_2	R_3	R_4
Hb, g/dl	10.10 ±0.478	10.20 ±0.478	11.33 ±0.337	11.38 ±0.272
RBC's x 10^6/µl	8.75 ±0.212	8.90 ±0.287	9.34 ±0.212	10.5 ±0.265
WBC's, x 10^3/µl	8.33 ±0.182	7.80 ±0.181	8.70 ±0.112	9.3 ±0.184
Lymphocytes %	35.33 ±0.451	36.66^b ±0.421	36.00^b ±0.414	48.33^a ±0.123
Total protein g/100ml	5.95^b ±1.112	6.06^b ±1.416	5.88^b ±1.196	6.48^a ±1.112
Albumin(A), g/100ml	3.00^b ±2.621	3.20^b ±1.023	3.24^b ±2.145	3.38^a ±2.021
Globulin(G), g/100ml	2.95 ±0.123	2.86 ±0.174	2.64 ±0.125	3.10 ±0.123
Albumin/Globulin ratio,(A/G)	1.02 ±1.512	1.12 ±1.014	1.23 ±1.485	1.09 ±1.511
Urea, mg/100ml	47.3^b ±0.214	46.4^b ±0.458	53.6^a ±0.451	56.5^a ±0.421
Creatinine, mg/100ml	0.59^a ±0.101	0.45^b ±0.121	0.49^b ±0.133	0.38^c ±0.118
Glucose, mg/100ml	57.21 ±0.412	58.33 ±0.458	62.67 ±0.214	63.33 ±0.421
Triglycrides mg/100ml	59.00^a ±0.321	57.00^b ±0.214	47.00^c ±0.123	51.00^c ±0.412
Cholesterol, mg/100ml	115.0^a ±0.412	99.83^b ±0.432	82.83^b ±0.403	81.66^c ±0.411
ALT, u/l	23.00^a ±0.107	18.67^b ±0.133	18.33^b ±0.121	15.48^c ±0.133
AST, u/l	38.00^a ±0.113	37.20^a ±0.133	30.3^b ±0.103	27.6^c ±0.146

a, b and c: Means of the same row with different superscript are significantly different ($P<0.05$).

Economical study:

In this study (Table 7) results of the economical study showed that the feed cost/kg weight gain (L.E) of the control treatment (R_1) showed the highest values while the lowest cost was for R_4. The best relative economical efficiency was detected with (R_4). These results are in agreement with the results obtained by Deraz (1996) who indicated that the chemical and chemofungal treatment decreased the cost of feed used to produce kg live body weight gain.Abd El-Aziz (2002) observed that replacing 40% of the FM by biologically treated rice straw reduced the cost of feeding by 28.8%.Allam *et al.* (2006) reported that the treated sugar beet pulp biologically to replace 0, 60, 75 or 100% of corn grain for growing lamb (groups R_1, R_2, R_3 and R_4, respectively) showed the least feed cost/kg gain for lamb treatment (R_4).

Table (7): Effect of incorporation of treated corn cobs in ration on economical efficiency of growing lambs.

Item	Treatment			
	R_1	R_2	R_3	R_4
DMI (g/h/d)	1627	1645	1644	1666
Feed mixture (DMI), g	1057	1065	1064	1066
Roughage (DMI), g	570	580	580	600
Av. daily gain (kg/h/d)	0.240	0.242	0.266	0.275
Av. feed cost (h/d/LE)	1.245	1.214	1.170	1.136
Av. revenue of daily gain (LE)	4.080	4.114	4.522	4.675
Net feed revenue (LE)	2.835	2.900	3.352	3.539
Economic feed efficiency (%)	227.71	238.88	286.49	311.53
Relative economic efficiency (%)	100	104.90	125.81	136.80

Price of ton CFM R_1 = 1017 LE R_2 = 977 LE R_3 = 937 LE R_4 = 897LE (including 100LE/ton as cost for biological (treatment + manufacture) price of 1 ton clover hay = 700LE. Price of 1 ton groundnut vines hay = 300 LE. Price of 1 ton corn cobs = 200 LE. Market price of 1 Kg live body weight in (2006) = 17. L.E.

Results of the present study indicated that, replacement of 10% of corn cobs treated with (fungal+ yeast) instead of Berseem hay in lambs diets did not significantly adverse growth and feed utilization parameters and did not improve economic feed efficiency. However, replacement of 20% and 30% of treated corn cobs instead of Berseem hay in sheep diets were significantly affected growth and feed utilization parameter and reduced feed cost/kg diet. The higher replacing levels with instead of Berseem hay significantly increased growth and feed utilization parameters and also reduced feed cost/kg diet and feed cost/kg weight gain.

CONCLUSION

From the results obtained in the present study, it could conclude the possibility of replacing 30% of Berseem hay by treated corn cobs with (fungus+ yeast) in sheep diets without adverse effect on growth or feed utilization parameters. This replacement reduced feed costs/kg diet and feed costs/kg weight gain and improved economic efficiency for feeding sheep.

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تحسين الأستفادة من قوالح الأذرة فى علائق الأغنام باستخدام المعاملات البيولوجية

رضا سلامة[١] – رشدى إبراهيم القاضى[٢] – ممدوح إبراهيم محمد[٢] – محمد عبد المجيد برعى[١]- صبرى عبد الله السيد عبد الله[٢]

1- قسم الإنتاج الحيوانى – كلية الزراعة – جامعة الأزهر – مصر

2- قسم الإنتاج الحيوانى – المركز القومى للبحوث – دقى – جيزة - مصر

استخدم ٢٠ ذكر حمل نامى (رحمانى × أوسيمى) عمر ٤ شهور ومتوسط وزن ٢٨كجم قسمت إلى أربعة مجموعات كل مجموعة خمسة حملان لدراسة تأثير المعاملة البيولوجية (فطر + خميرة) على قوالح الذرة.

تم تغذية حيوانات المعاملة الأولى أو المقارنة (R_1) على مخلوط علف أحتوى على مواد مركزة بالإضافة لدريس البرسيم بنسبة ٣٠% (العليفة المقارنة). أما حيوانات المعاملة الثانية (R_2) والمعاملة الثالثة (R_3) والمعاملة الرابعة (R_4) فقد غذيت حيواناتها على مخلوط من العلائق المركزة احتوت على قوالح الذرة المعاملة بيولوجياً بفطر *Trichoderma reesei F-418*+ خميرة *Saccharomyces cervisive AFZ-98* لمعرفة تأثير إحلال ١٠ و ٢٠ و ٣٠% من القوالح المعاملة محل دريس البرسيم و مخلوط العلف. قدم مخلوط العلف للمجاميع الأربعة بواقع ٣% من وزن الجسم يوميا بينما غذى عرش الفول السودانى بحرية واستمرت التجربة لمدة ٩٠ يوماً. وكانت أهم النتائج التى تم التوصل اليها:

1) سجلت معدلات الزيادة اليومية وكذلك الكفاءة الغذائية أعلى معدلات لها لمجموع حيوانات المعاملة (٤) يليها المجموعة (٣) بفارق معنوى عن المجموعة (٢) بالمقارنة بمجموعة المقارنة
2) تفوقت معاملات هضم كلاً من المادة الجافة والمادة العضوية والبروتين الخام و الدهن الخام فى المعاملة (٤) بالمقارنة بباقى المعاملات بفارق معنوى. بينما لا توجد اختلافات فى معامل هضم الكربوهيدرات الخام.
3) سجلت الأحماض الدهنية الطيارة الكلية وكذلك أمونيا نيتروجين سائل الكرش أعلى معدلات لها عند ٣ ساعات من بداية التغذية وكانت جميعها مرتفعةبالنسبة لجميع المعاملات البيولوجية عن المجموعة المقارنة.
4) تحسنت صورة الدم وكذلك وظائف الكبد والكلى للمعاملات المختلفة مقارنة بمجموعة المقارنة بدون أى أضرار صحية على الحيوانات.
5) أوضحت النتائج أن أقل تكلفة للغذاء لانتاج ١كجم وزن مكتسب كانت للمجموعة الرابعة.

ويستخلص من هذه الدراسة إمكانية استخدام المعاملة البيولوجية (فطر + خميرة) لقوالح الذرة حتى نسبة ٣٠% احلال من العليقة المركزة لتحقيق أفضل أداء إنتاجى للحملان النامية.