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NUTRIENTS UTILIZATION AND GROWTH PERFORMANCE OF LAMBS FED RATIONS CONTAINING CORN STOVER TREATED CHEMICALLY AND BIOLOGICALLY.

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ABCTRACT

Twenty five crossbred (1/4 Finnish + 3/4 Rahmany) male lambs weighed 19.2 kg on average and aged 4 months were used in a 182 day feeding trial. Animals were randomly divided into five equal groups (5 animals each) to study the effect of feeding chemically and biologically treated corn stover residues on animal performance, nutrients digestibility, carcass characteristics and feed efficiency. The experimental lambs were randomly assigned into five experimental rations as follows: C (control) : 2% of LBW CFM (concentrate feed mixture) and. berseem hay *ad lib* ; ration T1: 2 % of LBW CFM and fungus (*T.herizanum* F-416) plus yeast culture (*S. cerevisiae*) treated corn stover with 1% urea and 3% El-Mufeed *ad lib*, ration ; T2 : 2 % of LBW CFM and yeast culture (*S.cerevisiae*) treated corn stover with 1% urea and 3% El-Mufeed *ad lib* ; ration T3: 2 % of LBW CFM and corn stover silage with 3% El-Mufeed *ad lib* ; ration T4: Ration T3 plus 5gm /h /d of dried baker's yeast culture (*S.cerevisiae*), respectively.

Results showed that digestibility coefficients of all nutrients except of DM were higher with T1(fungus plus yeast) than those in C,T2,T3 and T4 rations .While, ration of corn stover silage (T3) had the lowest values of DM,OM and CP digestibilities . Also, treated corn stover with fungus plus yeast or with yeast only led to significantly ($P<0.05$) increased CP digestibility than corn stover silage rations (T3 and T4, respectively). Nutritive values as TDN and DCP were the highest with both rationsT1,coculture (69.64 % and 11.10%) and control, C (69.16% and 11.67%) ,respectively than those of the other rations. The differences were significant ($P<0.05$) with both TDN and DCP values. The ruminal parameters (pH and NH3-N) recorded the highest values with corn stover silage (T3) ration compared with the other rations ; while, the highest ($P<0.05$) values of TVFA's were obtained with T1 (coculture) ration compared with the other rations. Average total DM intake (g/h/d) was significantly ($P<0.05$) decreased with groups fed rations of T1,T2 ,T3 and T4 by 30 58, 27.71, 32.82 and 31.34 %, respectively compared with the control group. Similar trend was observed with feed intake (g/h/d) as TDN and DCP between the tested groups and the control group.

Average daily weight gain (g/h) was improved significantly ($P<0.05$) for group T1, coculture (135.17) compared with the other groups . Feed conversion (kg / kg gain) as DM and TDN was improved significantly ($P<0.05$) with lambs fed T1 ration followed by T4 , T3 and then T2 ration, respectively than those fed the control ration .Whereas, kg DCP/ kg gain showed the best value with lambs fed both rations of T4 and T3 (silage rations) followed by T2 and then T1 ,respectively compared with the control. Dressing percentage %(as fasting body weight) was significantly ($P<0.05$)

higher for lambs fed T2 ration followed by those fed T4, C and then T3 ration, respectively. The lowest dressing percentage was recorded for T3 ration. The best economic efficiency was recorded for rations containing corn stover treated with fungus plus yeast (T1) , treated with yeast only (T2) and corn stover silage with or without yeast additive(T4 and T3) compared with the control ration.

Keywords: Corn stover , Biological treatments, Feeding value, Lambs performance ,Carcass traits, Economic efficiency.

INTRODUCTION

Maize plant occupied about 1.658 million feddan (about 12.7 % of cropping area) and produced about 5.682 million ton of green corn stover residue (Agriculture Economics , 2003). Conserving green corn stover with or without additives as silage is practical importance in animal feeding , especially in summer season (El-Hosseiny *et al.*, 1990 ; Bendary and Younis, 1997; Hanafy *et al.*, 2000 ; Bendary *et al.*,2001 and Ahmed *et al.*,2003) .

In the recent years much interest has been given for upgrading nutritional quality of roughages, especially cellulose and lignin using, lignocellulolytic organisms and / or their enzymes (chemical and biological treatment) such as fungi ,yeast and bacteria or combinations between them (Deraz,1996; El-Ashry *et al.*, 1997; Fouad *et al* ,1998; Kholif, 2001 and Bassuny et al.,2003 b).

The objective of this study was to evaluate the effect of feeding chemically and biologically treated corn stover residues and corn stover silage on animal performance, nutrients digestibility, carcass characteristics and feed efficiency of growing lambs.

MATERIALS AND METHODS

This work was carried out at Mahelat Mousa Experimental Station, Kafer-El-Sheikh Governorate, Animal Production Research Institute, Ministry of Agriculture, Egypt .

Biologically treated corn stover residue:

Microorganisms:

Trichoderma herizanum F-416 and *Saccharomyces cerevisiae* AFZ-98 were obtained from the Microbial Chemistry Department, National Research Center, Dokki, Giza, Egypt.

Preparation of fungal inoculum:

The fungal strain was cultured in a medium contained (g/ litter) the following: 3.0 ammonium sulfate ,0.5 sodium chloride, 0.3 magnesium sulfate, 0.5 yeast extract and 10.0 glucose. Fifty ml of the previous media was introduced into 250 ml conical flask. The flasks were autoclaved at 121° C for 15 minutes. Sterilized flasks were incubated with a loop at 3 days old cultured slants of *T.herizanum*. The flasks were incubated on a rotary shaker (150 r.p.m./ hr.) at 25 ± 2° C for 48 hrs.

Scaling up the fungal treatments :

The growing fungal mycelium was employed at 5% to inoculate the experimental flasks. Five litter capacity flasks each, contains 200 g sample

were packed in a nylon bag and incubated with 200 ml from growing fungal medium (w/v) .The treated material was adjusted with media to approx. 65 % moisture and bagged in air tight polyethylene sheets. The bags were closed and incubated at room temperature for 7 days. The above fermented bags contents were applied for inoculating the large scale corn stover residues at 10 % (w /w) .

Yeast culture:

Saccharomyces cerviciae AFZ- 98 was cultured in a medium contained 2.0 g urea /litter (10 % molasses solution).

Hundred ml of the above medium were introduced into 250 ml conical flasks .The flasks were autoclaved at 121 $^{\circ}$ C for 15 minutes. Sterilized flasks were incubated with a loop at 48 hrs.old slants of *Saccharomyces cereviciae* .The flasks were incubated on a rotary shaker (150 r.p.m./ hr.) at 25 ± 2 $^{\circ}$ C for 48 hrs. The growing yeast culture was employed at 5 % to inoculate the experimental flasks. Five litter capacity flasks, each contains 200 g sample was packed in a nylon bag and incubated with 200 ml from growing yeast medium (w/v) .The treated material was adjusted with medium to approx. 65 % moisture and bagged in air - tight polyethylene sheets. The bags were closed and incubated at room temperature for 5 days. The above fermented bags contents were applied for inoculating the large scale corn stover residues at 10 % (w /w) .

Combined fungus and yeast treatment:

Fungus and yeast above inocula were employed at 5% (w/w) each to inoculate 200 g of corn stover residues . The treated material was adjusted with media to approx. 65 % moisture and packed in a nylon bag . The bags were closed and incubated at room temperature for 5 days.

Application of biological treatment:

Two piles of corn stover residues (about ten tons each) were chopped to 2-3 cm and spread on ground at 25 cm depth , moistened with solution of 3 % El-Mufeed and 1%urea which dissolved in tap water to keep the moisture content about 65 % . The 1st pile was mixed with above fermented bags content of combined fungus and yeast at 10% (w/w) ; whereas, the other one was mixed with the above fermented bags content of yeast culture at 10 % (w /w) . The fermentation was done at the open air for 21 days.

Silage making :

Chopped corn stover residue (about ten tons) was ensiled between manger using wheel tractor to ensure good baking every successive layers. El-Mufeed (3% asfresh basis) was diluted in twice its volume of tap water to increase the moisture content of corn stover residue to about 65% and sprayed on each layer . Silo was tightly covered by plastic sheet followed by approximately 20 cm layer of soil to maintain anaerobic condition .

Animals and feeding :

Twenty five crossbred (1/4 Finnish + 3/4 Rahmany) male lambs weighed 19.2 kg on average and aged 4 months were used in a 182 day feeding trial . All groups of animals were fed 2 % of LBW concentrate feed

mixture (CFM) and *ad lib* one of the following roughages : berseem hay (C, control) ; , corn stover treated with fungus (*T.herizanum* F-416) plus yeast culture (*S.cerevisiae*) and 1% urea and 3% El-Mufeed (T1); corn stover treated with yeast culture (*S.cerevisiae*) and 1%urea and 3% El-Mufeed (T2) ; corn stover silage with 3% El-Mufeed (T3) and ration T3 plus 5gm /h /d of dried baker's yeast culture (ration T4), respectively.

The growing lambs were fed all roughages *ad lib* after receiving the concentrate feed mixture once daily at 8 am. Water was available all time. Concentrate feed mixture was adjusted biweekly according to body weight change .Animals were individually weighed biweekly just before eating and drinking. Daily feed intake and refusal were recorded .Daily weight gain and feed efficiency were calculated. The concentrate feed mixture (CFM) consists of : 42% wheat bran, 23% undecortecated cotton seed meal, 22% yellow maize, 5% rice bran, 4% molasses , 3% limestone and 1% common salt.

At the middle of the experimental feeding period (90days) ,three lambs were randomly chosen from each treatment groups to estimate the nutrients digestibility coefficients . Animals were placed in metabolism crates and fed on the previous rations for 5 days as a preliminary period and the 3 days for the collection period .During collection period , samples of feedstuffs, feces and refused feeds were dried for chemical analysis according to A.O.A.C (1995) . At the last day of the collection period, rumen liquor samples were withdrawn using stomach tube at 0, 3 and 6 hrs. Post morning feeding. The samples of rumen liquor were filtered through four layers of cheese cloth and immediately tested for pH values using digital pH meter (Orian Res - EARH, Model 30). Strained rumen liquor was stored at 20°c with few drops of toluene and paraffin oil to cover the surface of samples to analyze ammonia-N concentration according to Conway and total volatile fatty acids (TVFA'S) according to Warner (1964) . After finishing the digestibility trials animals returned back again to their feeding groups .

At the end of the experimental feeding trials (182 days), three animals from each feeding group were randomly chosen, fasted for 16 hours and weighed immediately before and after slaughtering .Hot carcass ,body offal's and internal organs were separately weighed and dressing percentage was calculated. Carcass components were estimated according to Colomer *et al* .,(1987) .Samples were taken from 9^{th} -11^{th} ribs cut for chemical analysis according to A.O.A.C (1995) and to determine some physical characteristics such as the pH value, tenderness water holding capacity and colour intensity . The pH value, tenderness and water holding capacity were measured according to method described by Grou and Hamn (1957) and colour intensity of meat was measured according to Hussaini *et al* ., (1950). Area of rib eye was measured by calk paper placed over the cut surface and measured by planimeter.

Statistical analysis:

The data were statistically analyzed using a general linear model procedure (GLM) according to SAS (1998).Duncan multiple range test (Duncan, 1955) was used to determine the significant differences.

RESULTS AND DISCUSSION

Chemical composition of the experimental feedstuffs :

Results in Table (1) indicate that treated corn stover with fungus plus yeast or with yeast only or conserved as silage increased the content of CP, EE, and ash, whereas, OM, CF, NFE, NDF, ADF, ADL, hemicellulose and cellulose percentages decreased compared with the untreated corn stover. These results were confirmed by those of El-Ashry *et al.*, (1997,2002 and 2003) and Khorshed (2000) using fungal or yeast culture treated corn stalks or combination of them.

The improvement rates of CP, EE and ash percentages (Table 1) were 57.90, 129.13 and 19.90% for T1 and 57.24, 59.06 and 19.20% for T2, respectively. On the other hand, NDF, ADF, ADL, hemicellulose and cellulose percentages reduced by 10.17, 12.21, 41.40, 7.23 and 6.29. for T2 and 9.00, 11.50, 39.07, 5.40 and 5.91% for T1, respectively.

On the other hand, urea silage increased CP, EE and ash contents by 34.78, 144.88 and 20.00%, respectively. Whereas, the chemical analysis of corn stover silage in this study was lower than those obtained by El-Hosseiny (1984) , Abdel- Bake *et al.,(*1989) and El- Hosseiny *et al.*, (1990) . Also, increasing CP value with corn stover silagewas due to EL-Mufeed addition which containing 2.5% urea which had more water insoluble N (Huber et al., 1973). While, increasing EE content in silage may be due to increasing fermented materials produced during ensiling process (El-Hosseiny , 1984).

Table (1): Chemical composition of the experimental feedstuffs (on DM basis).

Item	DM	Nutrient % of DM										
		OM	Ash	CP	CF	EE	NFE	NDF	ADF	ADL	Hemi	Cellu.
CFM	91.67	89.41	10.59	16.78	10.27	3.59	58.77	24.81	7.33	4.29	17.48	3.04
Berseem hay	92.18	88.94	11.06	14.28	31.72	2.89	40.05	44.96	31.65	7.99	13.31	23.66
Beakers yeast	91.00	92.70	7.30	41.40	3.20	9.00	39.10	-	-	-	-	-
Corn stover	90.69	89.95	10.05	6.01	31.88	1.27	50.79	69.04	40.70	6.86	28.34	33.84
FYCST *	34.40	87.95	12.05	9.49	26.72	2.91	48.83	62.02	35.73	4.02	26.29	3,.71
YCST **	37.70	88.02	11.98	9.39	27.43	2.02	49.18	62.83	36.02	4.18	26.81	31.84
CSST ***	34.45	87.94	12.06	8.10	28.34	3.11	48.39	61.42	33.42	3.84	28.00	29.58

*** FYCS : Fungal and yeast treated corn stover plant.**
**** YCS : Yeast treated corn stover plant.**
***** CSST : Corn stover silage with El-Moufeed.**

The increased ash content was related to El-Mufeed addition which containing some trace minerals and inorganic phosphorus. It is worthy noting that biological treatments were of more pronounced effect on improving crude protein than corn stover silage; While, corn stover silage was very effective in improving EE% than those in biological treatments. Moreover, biological treatments and corn stover silage had a positive affect in reducing CF fractionations.

Nutrient digestibility and feeding values:

Results in Table(2) show that, rations containing corn stover treated by combined fungus plus yeast (co-culture ,T1) have the highest values in digestion coefficients for all nutrients , except with DM digestibility than C, T3

and T4 rations, respectively. The differences were significantly (P<0.05) higher with DM, OM and NFE digestibility; while, no differences existed among T1, T2, and T3 in CP digestibility or between T1 and T2 in EE digestibility.

The combination with *(S.cerevisiae)* probably provided stimulatory factors for rumen microbes while with fungus produced phenol oxidizes and / or some cellulases that made most beneficial (El-Sayed *et al.*, 2002). Also, Rosenberg and Wike (1980) noticed that further improvements might be obtained by exploiting the synergistic activities of mixed cultures.

Table (2):Digestion coefficients and nutritive values for the experimental rations.

Item	Control (C)	Biological treatments		Corn stover silage	
		T1	T2	T3	T4
Digestibilities %					
DM	86.21^{a}	80.30^{b}	72.33^{c}	68.81^{c}	69.87^{c}
OM	75.88^{b}	82.62^{a}	74.73^{b}	70.85^{b}	72.11^{b}
CP	75.18^{a}	77.29^{a}	74.48^{a}	67.29^{b}	70.23^{b}
CF	66.41^{a}	67.53^{a}	62.67^{b}	63.97^{ab}	67.14^{a}
EE	73.44^{c}	86.66^{a}	85.33^{a}	81.69^{b}	86.66^{a}
NFE	77.83^{c}	84.53^{a}	76.67^{c}	76.77^{c}	80.43^{b}
Nutritive value%					
TDN	69.16^{a}	69.64^{a}	64.41^{b}	63.11^{b}	66.88^{ab}
DCP	11.67^{a}	11.10^{a}	9.04^{b}	8.87^{b}	9.36^{b}

a, b and c : Means with different superscripts in the same row are significant (P<0.05).
T1 : Rations containing corn stover residue treated with mixture of fungus and yeast+ 2 % of LBW CFM.
T2 : Rations containing corn stover residue treated with yeast + 2 % of LBW CFM.
T3 : Rations containing corn stover silage with El-Moufeed + 2 % of LBW CFM.
T4 : Rations containing corn stover silage (T3) + 5 g/h/d oral yeast additive + 2 % of LBW CFM.

On the other hand, El- Ashry *et al.*, (2002) found that fungal treatments of corn stalk improved IVDMD and IVOMD that treated with co-culture of fungus plus yeast or treated with yeast only.

In addition, both silages in rations T3 and T4 (Table,2) had the lowers values in DM, OM and CP digestibility than those of the other the rations C,T1 and T2. The differences were significant (P<0.05). Yeast addition with corn stover silage in ration T4 increased the apparent digestibility of all nutrient values as compared with ration T3. The differences were significant (p<0.05) with EE and NFE digestibilities, but no differences existed between rations T3 and T4 in DM, OM, CP and CF digestibilities. The increase might be due to that yeast increased number of cellulolytic bacteria as indicated previously by Wiedmeier *et al.* (1987), or the increase in fermentation capacity of the rumen (Hughes, 1988) or that presence of yeast 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.*, 1998). Also, results in Table (2) revealed that ration T1 (co-culture) had the highest nutritive value as TDN (%) followed by the control ration and then T4 ration, while, rations T2 and T3 had the least nutritive values as TDN. Statistical

analysis showed that the TDN of ration T1 was higher (P<0.05) than those of rations T2 and T3 while insignificant differences were existed among rations C, T4 and T1 . The respective values of TDN were 69.16, 69.64, 64.41,63.11 and 66.88% for C, T1, T2, T3 and T4 rations,respectivily. These values were higher than those found by Khorshed (2000) who reported that fungal or yeast treatments increased the nutritive values of corn stalks, wheat straw, rice straw and cotton stalks . However El-Ashry *et al.* (1997) found that TDN content increased from 63.93 and 63.35% in the control to 72.31 and 72.88% in fungal treated rice straw and corn stalks, respectively. While Reddy and Reddy (1991) noticed that baddy straw treated with fungi did not improve its nutritive values.

The results in Table (2) revealed that rations C and T1 were significantly (P<0.05) higher in DCP than those of T2, T3 and T4 rations. Whereas, the lowest value was recorded with T3 and with no significant differences among rations T2, T3 and T4.

Rumen liquor parameter:

Results of ruminal pH,ammonia nitrogen and total volatile fatty acids are presented in Table(3) .There are significant differences among treatments and among sampling times in pH values ,NH3-N and TVFA,s. The overall means of the sampling time of ruminal pH value increased with yeast culture either treated corn stover,T2 (6.70)) or with silage as additive ,T4 (6.59) than those in T3 and the control groups. These results are in agreement with those reported by Sohn and Song (1996) and Sharma *et al.* (1998). They found a significant increase in ruminal pH with yeast supplemented ration.

The pH values of rumen liquor in the present study are within the range reported by Rakha (1988) who reported that the normal ruminal pH of sheep ranged between 4.96 and 7.92. The overall means of sampling times of ammonia nitrogen concentration in the rumen (Table 3) were 18.19, 18.93, 14.53, 21.37 and 15.93 m g/ 100 ml for C, T1, T2, T3 and T4, respectively.

Table (3):Effects of the experimental rations and sampling times on some rumen liquor parameters

Item	Sampling time (hr.)	Control (C)	Biological treatments		Corn stover silage	
			T1	T2	T3	T4
pH	0	6.23^{b}	6.75^{a}	6.58^{a}	6.53^{a}	6.53^{a}
	3	6.52^{a}	5.80^{b}	6.84^{a}	6.51^{a}	6.51^{a}
	6	6.71^{a}	6.35^{b}	6.67^{a}	6.72^{a}	6.72^{a}
Average		**6.43^{ab}**	**6.29^{b}**	**6.76^{a}**	**6.59^{a}**	**6.59^{a}**
Ammonia nitrogen (mg/100 ml)	0	17.65^{a}	15.44^{b}	13.19^{c}	16.45^{ab}	13.49^{c}
	3	20.57^{bc}	28.12^{a}	18.57^{c}	27.98^{a}	21.14^{b}
	6	16.34^{ab}	13.22^{b}	11.84^{b}	19.69^{a}	13.17^{b}
Average		**18.19^{b}**	**18.93^{b}**	**14.53^{c}**	**21.37^{a}**	**15.93^{c}**
TVFA's (meq/100 ml)	0	7.46^{b}	10.93^{a}	7.67^{b}	6.93^{b}	7.87^{b}
	3	12.13^{a}	15.20^{a}	14.33^{a}	12.70^{a}	13.00^{a}
	6	10.27^{ab}	11.33^{a}	9.40^{ab}	9.73^{ab}	9.00^{b}
Average		**9.95^{b}**	**12.49^{a}**	**10.47^{ab}**	**9.69^{b}**	**9.96^{b}**

a, b and c : Means with different superscripts in the same row are significant (P<0.05).

Yeast treated corn stover ration (T2) and yeast additive to corn stover silage ration (T4) had significantly (P<0.05) decreased ammonia

nitrogen concentration throughout the sampling times than that in other treatments. These results are disagreed with those of Kobayashi *et al.* (1995) , Yoon and Stern (1996) and Putnam *et al.* (1997) who noticed that NH3-N concentration was not affected by yeast culture supplementation of dairy cow rations. The overall mean of sampling times of ruminal TVFA,s was higher with lambs fed rations T1 and T2 compared with lambs fed the other rations. The differences were significantly with ration T1 and insignificantly with ration T2.

Growth performance and economical efficiency :

Data in Table (4) revealed that the average daily DM intake as g/h was significantly ($P<0.05$) decreased by 30.58 , 27.71, 32.82 and 31.34 % for T1, T2, T3 and T4 rations , respectively compared with C ration. The averages of DM intake g/h/d were 1243.54, 863.28, 898.92, 834.51 and 853.78 for C, T1, T2, T3 and T4 groups, respectively. Reduction in feed intake may be attributed to the increased NH3-N concentration in blood (Khorshed, 2000). Similar results were obtained by Bassuny *et al.* (2003 a) who found that DM intake for rams fed rations containing urea or urea + fungi treatments were decreased by 25.33 and 4.32 % with corn cobs and 37 38 and 30.07 % with sugarcane bagasse , respectively. While, Deraz (1996) observed that chemical and biological treatments increased markedly voluntary DM intake of corn stalks by 63.3 and 33.8%, respectively compared with mechanically treated corn stalks.

Also, feed intake as TDN g/h/d (Table, 4) was significantly ($P<0.05$) decreased with lambs fed rations of T1, T2, T3 and T4 than those fed the control ration. The lowest value was recorded with T3.The differences were significantly ($P<0.05$).The values of feed intake as TDN g/h/d were 860.03,601.19,578.99,526.66 and 571.01 for C, T1 ,T2 ,T3 and T4,respectively. Nearly similar trend was observed with DCP intake (g/h/d) between treated corn stover groups and the control group.

The highest daily gain (g/h) was obtained with co-culture ration ,T1 (135) followed by the control ration ,C (126), T4 (123), T2 (118) and then T3 silage rations (112). The differences among groups were significant ($P<0.05$). Deraz (1996) found that average daily weight gains, were 80.06, 77.92, 101.75, 108.25, 106.04 and 113.64 g/h for lambs fed on ration containing mechanically treated rice straw, mechanically treated corn stalks, urea ammoniated rice straw, urea ammoniated corn stalks, fungal treated rice straw and fungal treated corn stalks ,respectively. These values are lower in daily weight gain than those in the present study.

Feed conversion (Kg /Kg gain) as DM and TDN in Table (4) showed that T1 (co-culture) recorded the best values followed by T4, T3 and then T2, respectively than that in the control. The differences were significant ($P<0.05$).However, feed conversion as kg DCP/ Kg gain showed the best values with both rations of corn stover silage (T4 and T3) followed by T2 and then T1, respectively than that in the control . Deraz (1996) found that animals fed biological treated roughages were the most efficient groups as kg DM/kg gain followed by those chemically treated roughages. Rates of

improvement in feed conversions as kg DM/ kg gain were averaging between 10.00 to 23.00%.

Feed cost per kg gain in (Table, 4) was lower with T1(co-culture) followed by T4 ,T2 and T3 rations, respectively compared with the control ration . Whereas, the control ration was the highest in feed cost / kg gain (5.659 L.E.). It was noticed that chemical and biological rations (T1 and T2) and corn stover silage rations (T4 and T3) were cheaper than the control ration by 26.17, 14.65, 19.40 and 11.95 % ,respectively. Deraz (1996) noticed that the lowest feed cost was recorded with animals fed biological treated corn stalks.

Results in Table (4) indicated that economic efficiency increased from 76.71% in the control ration to 139.35, 107.04, 99.48 and 119.25 % for rations of T1, T2, T3 and T4, respectively.

Table (4): Growth performance of growing lams fed the experimental rations.

Item	Control (C)	Biological treatments		Corn stover Silage	
		T1	T2	T3	T4
No. of animals	**5**	**5**	**5**	**5**	**5**
Experimental periods (days)	182.00	182.00	182.00	182.00	182.00
Av. Initial body weight (kg)	19.00	19.00	19.40	19.40	19.00
Av. Final body weight (kg)	42.00	43.60	40.80	39.80	41.40
Total gain (kg)	23.00	24.60	21.40	20.40	22.40
Av. Daily gain (g/h/d)	126.00^{b}	135.17^{a}	117.58^{c}	112.09^{c}	123.08^{b}
Dry mater intake (g/h/d):					
Concentrates	563.77	567.44	543.60	553.52	552.77
Berseem hay	679.77				
Corn stover treated by (F + Y)		295.840			
Corn stover treated by (Y)			355.32		
Corn stover silage				300.99	
Corn stover silage + yeast					301.01
Daily nutrient Intake (g/h/d:					
DM	1243.54^{a}	863.28^{b}	898.92^{b}	834.51^{c}	853.78^{bc}
TDN	860.03^{a}	6o1.19^{b}	578.99^{b}	526.66^{c}	571.01^{b}
DCP	145.12^{a}	95.82^{b}	81.26^{b}	74.02^{b}	79.91^{b}
Feed Conversion (kg/kg gain):					
DM	9.87^{a}	6.39^{c}	7.65^{b}	7.45^{b}	6.94^{b}
TDN	6.83^{a}	4.45^{c}	4.92^{b}	4.70^{b}	4.64^{bc}
DCP	1.15^{a}	0.71^{b}	0.69^{b}	0.66^{b}	0.65^{b}
Feed cost (L.E) :					
**Total feed cost (L.E /h/d)	0.713	0.564	0.568	0.562	0.561
Feed cost /kg gain (L.E)	5.659^{a}	4.178^{b}	4.83^{b}	5.013^{ab}	4.561^{b}
***Economic efficiency %	76.71	139.35	107.04	99.48	119.25

****Local price of feed: 800 L.E./ton of CFM, 300 L.E./ton of hay, 80 L.E./ton of corn stover treated with fungus**

plus yeast,100 L.E./ton of corn stover treated with yeast and 90 L.E./ton of corn stover silage. whereas dried

yeast price of kg was 11.00 L.E.and price of kg gain was 10.00 L.E. (based on year 2002 prices)

a, b and c : Means with different superscripts in the same row are significant (P<0.05).

***Economic efficiency% = $\frac{\text{Price of Kg gain} - \text{Feed cost /Kg gain}}{\text{Feed cost /Kg gain}} \times 100$

Carcass traits, physical characteristics and chemical composition:

Data in Table (5) showed that hot carcass weight with or without edible offal was significantly (P<0.05) decreased with animals fed on silage ration (T3) compared with those fed ration of (C), T1 and T4, while, it was insignificantly decreased than those fed ration (T2). On the other hand, dressing percentage(on the basis of hot carcass weight with or without edible organs) relative to (fasting weight) was significantly (P<0.05) higher in lambs fed T2 ration followed by those fed T1 , T4, C and T3 rations. These results are in accordance with Khattab *et al.* (2003) with yea- sac and Lacto-sac in lambs ration.

Table (5): Effect of the tested rations on dressing percentage and carcass cuts of lambs.

Item	Control (C)	Chemical biological treatments		Corn stover Silage	
		T1	T2	T3	T4
Fasting body weight (kg)	41.66^{a}	41.33^{a}	36.66^{b}	37.33^{b}	40.66^{a}
* Hot carcass weight (kg)	20.60^{a}	20.73^{a}	19.33^{ab}	17.23^{b}	20.27^{a}
** Hot carcass weight (kg)	17.63^{a}	18.38^{a}	16.67^{ab}	15.62^{b}	17.08^{a}
Dressing percentage [1]	49.45^{b}	50.16^{b}	52.73^{a}	46.16^{c}	49.89^{b}
Dressing percentage [2]	42.32^{b}	44.47^{a}	45.47^{a}	41.84^{b}	42.01^{b}
Split right weight, kg	8.83^{b}	9.09^{a}	8.70^{b}	7.80^{b}	8.48^{b}
Split left weight, kg	8.80^{b}	9.29^{a}	7.97^{b}	7.82^{b}	8.60^{b}
Total split weight, kg	17.63^{b}	18.38^{c}	16.67^{a}	15.62^{c}	18.54^{b}
Legs weight, kg	0.87^{b}	1.16^{a}	1.06^{a}	1.00^{a}	0.89^{b}
Head weight , kg	2.61	2.75	2.60	2.56	2.53
Skin weight (kg)	3.93^{a}	3.52^{a}	4.07^{a}	2.70^{b}	4.00^{a}
Full digestive tract, kg	10.63^{a}	8.38^{b}	9.48^{c}	7.75^{b}	9.13^{ab}
Empty digestive tract, kg	5.63^{a}	4.32^{b}	4.42^{c}	4.75^{c}	4.13^{ab}
Edible offal (kg):					
Liver weight	0.85^{a}	0.63^{c}	0.57^{d}	0.50^{e}	0.82^{b}
Kidneys weight	0.77^{a}	0.35^{d}	0.69^{b}	0.11^{e}	0.61^{c}
Heart weight	0.30	0.30	0.31	0.32	0.31
Tests weight	0.18^{c}	0.23^{b}	0.30^{a}	0.25^{b}	0.25^{b}
Spleen weight	0.20^{b}	0.17^{c}	0.13^{d}	0.10^{e}	0.24^{a}
Lungs and trachea weight	0.67^{b}	0.67^{b}	0.66^{b}	0.33^{c}	0.96^{a}
Total edible offals weight, kg	2.97^{b}	2.35^{d}	2.66^{c}	1.61^{e}	3.19^{a}

1 Dressing % (hot carcass weight including edible offals relative to fasting weigh).
2 Dressing % (hot carcass weight excluding edible offals relative to fasting weigh).
*** Hot carcass weight with total edible offals. ** Hot carcass weight without edible offals.**
a, b ,c , d and e : Means with different superscripts in the same row are significant (P<0.05).

Results of physical characteristics and chemical composition of eye muscle in Table (6) showed that area of eye muscle (cm2) was significantly (P<0.05) higher with lambs fed treated corn stover with yeast in T2 ration followed by yeast and fungus ration (T1) and then control rations (C) being 15, 14 and 13.6 cm2 ,respectively than those fed both of T3 and T4 silage rations. The differences among groups C, T1 and T2 were not significant. Lambs fed rations of corn stover treated with fungus plus yeast (T1) had

significantly (P<0.05) decreased water holding capacity than those in the other groups. It could be noticed that the water holding capacity of fresh meat of lambs fed T1 ration (combination between yeast and fungus) was better than that in lambs fed the other tested rations. Also, all lambs fed tested ration T1, T2, T3and T4 were significantly (P<0.05) lower in tenderness values than those fed the control ration. This may be due to the variation in moisture content of meats, different fiber diameter, amount of connective tissue and protein solubility as found by Soliman (1987) .The pH value of eye muscle was ranged from 5.99 to 6.20 .It was significantly (P<0.05) higher with C and T3 rations than those fed other rations. Also, CP and EE percentages of eye muscle did not affect by the tested rations; whereas, ash content was significantly (P<0.05) lower in lambs meat fed T1 ,T2 and T4 rations compared with those fed the control and T3 rations.

Table (6): Physical characteristics and chemical composition of eye muscle of lambs fed the Experimental rations.

Item	Control (C)	Biological treatments		Corn stover Silage	
		T1	T2	T3	T4
Physiological characteristics:					
Eye muscle area (cm^2)	13.66^{a}	14.00^{a}	15.00^{a}	11.60b	12.00^{ab}
Water holding capacity (cm^2)	28.00^{a}	24.00^{b}	29.00^{a}	27.00^{a}	28.00^{a}
Tenderness (cm^2)	1.20^{a}	1.06^{b}	1.10^{b}	1.06^{b}	1.06^{b}
pH-value	6.20^{a}	6.11^{b}	6.02b^{c}	6.20^{a}	5.99^{c}
Colour intensity, aptical density	0.60^{b}	0.48^{d}	0.53^{c}	0.44^{e}	0.71^{a}
Chemical composition % :					
Moisture	74.75	73.35	74.64	74.45	74.09
(On DM basis) :					
CP	80.41	81.10	81.10	80.03	80.66
EE	14.78	15.20	15.46	15.27	15.54
Ash	4.81^{a}	3.70^{b}	3.44^{b}	4.70^{a}	3.80^{b}

a, b ,c ,d and e : Means with different superscripts in the same row are significant (P<0.05).

From the results of this study It could be concluded that corn stover residue which treated chemically and biologically or preserved as silage could be successfully used for feeding growing lambs without any adverse effects, It reducs the feeding cost for meat production and reducing the environmental pollution as well. Moreover, treated corn stover residues with mixture of fungus (*T.harizanum*) and yeast culture (*S.serevisiae*) recorded the best nutrients digestibility , nutritive values ,daily gain and economic efficiency.

REFERENCES

Abdel-Baki,.S.M., M.S.Nowar, E.M.Hassonia, L.Soliman, H.M.Ghanem and A.Gad Alla (1989).Evaluation and Utilization of corn stalks fodder and its silage by sheep. Third Egyptian British Conference on Animal ,Fish and Poultry Production,7-10 October ,Alexandria .

Agriculture Economics (2003). Institute of Agric. Economics, Ministry of Agric., Egypt.

Ahmed,B.M.,H.T.Taire,M.M.Bendary and K.F.Abdel-Lateif (2003). Influence of dietary corn silage on digestibility ,performance and economical efficiency of dairy cattle. Egyptian J. Nutrition and Feeds,6 (special Issue).The 9th Conference on Anim. Nut.(Part II) Ruminants Nut., 14-17 October, Hurghada, Egypt.

A.O.A.C. (1995). Association of Official Analytical Chemists, Official methods of analysis. 16th Ed., Washington, D.C.

Bassuny, S.M., A.A. Abdel Aziz, A.Z. Chanim and M.Y.S. Abel-Aziz (2003 b). Fibrous crop by products as feed 3- Effect of treatments rice and bean straws by two kinds of fungi on chemical composition, cell wasll constituuents, digestibility and rumen volatile fatty acid fractions of sheep. Egyptian J. Nutrition and Feeds. 6 (Special Issue). The 9th Conference on Anim. Nut.(Part II) Ruminants Nut., 14-17 October, Hurghada, Egypt.

Bassuny, S.M., A.A. Abdel Aziz, M.F.EL-Sayis and M.A. Abdulla (2003a). Fibrous crop by products as feed 2- Effect of chemical and biochemical treatments on feed intake, nutritive values and some ruminal and blood consituents.Nutrition and Feeds. 6 (Special Issue). The 9th Conference on Anim. Nut.(Part II) Ruminants Nut., 14-17 October, Hurghada, Egypt.

Bendary, M.M. and M.A. Younis (1997). Evaluation of maize stalks for feeding dairy cows. Egypt. J. Appl., Sci., 12 (8): 11.

Bendary, M.M., G.H.A. Ghanem, E.S. Soliman, E.A. Amer and F.A. El-Zeer (2001). Nutritional evaluation of ensiling fresh maize stover. Nutrition and Feeds. 2 (Special Issue).The 8th Conference on Animal Nutrition, Part (1): Ruminants, 23-26 October, Sharm El-Sheikh, Egypt.

Colomer, F.P. Morand-Feher and A.H. Kirton (1987). Standard method and procedures for goat's carcass evaluation, joint tissue separation. livestock production, Science, 17:149.

Conway, E.F. (1958). Modification, Analysis and Volumetric Error. Rev. Ed-Lock Wood, London.

Deraz, T.A. (1996). The production of microbial protein from some agricultural wastes and its utilization in ruminant. Ph.D. Thesis, Ain Shams Univesity, Shobra El-Kheima, Cairo, Egypt.

Duncan, D.B. (1955). Multiple range and multiple F. tests. Biomerics, 11:1.

El-Ashry, M.A., M.F. Ahmed, S.A. El-Saadany, M.E.S. Youssef, I.A. Gomaa and T.A.A. Deraz (1997). Effect of mechanical vs. mechano-chemical or mechano-biochemical treatments of crop residues ,their use in ruminant rations: digestibility, nitrogen balance and some blood and rumen liquor parameters of sheep. Egyptian J. Nutrition and Feeds:1(Special Issue). The 6th Conference on Animal Nutrition, 17-19 November ,El-Minia, Egypt.

El-Ashry, M.A., H.M. El-SAYED, M. Fadel, H.M. Metwally and M.M. Khorshed (2002). Effect of chemical and biological treatments of some crop residues on their nutritive value. 2- Effect of biological treatments on chemical composition and in vitro disappearance. Egypt J. Nutrition and Feeds. 5 (1):43-54.

El-Ashry, M.A., A.M. Kholif, M. Fadel, H.A.El. Alamy, H.M. Sayed and S.M. Kholif (2003).Effect of biological treatments on chemical composition, in vitro and in vivo nutrients digestibilities of poor quality Roughages. Egyptian J. Nutrition and Feeds,. 6 (2):113-126.

El-Badawi, A.Y., H.M. Gado, and M.A. Tawila (1998). Influence of dietary yeast culture on lactation performance of goats. J. Agric. Sci., Ain-Shams Univ., Cairo, 6:111.

El-Hosseiny, H. M. (1984). Nutritional studies on silage. Ph.D. Thesis, Zagazig University

El-Hosseiny. H.M., E.A. Khafagi and I.A. Abou-Selim (1990). Laboratory studies on silage from corn stalks and rabbit excreta. Third International Symposium on Feed Manufacturing and Quality (C) control. 7-9 May, Cairo, Egypt.

El-Sayed, H. M, M. A., El-Ashry, H. M., Metwally, M. Fadel, and M. M. Khorshed (2002).Effect or chemical and biological treatments of some crop residues on their nutritive value: 3- digestion coefficient, rumen and blood serum parameters of goat.Egyptian J.Nutrition and Feeds,5 (1): 55-69.

Fouad, R.T., T.A. Deraz and S.A. Attia-Ismail (1998). Biological versus urea treament of roughages for sheep. J. Agric. Sci.,Mansoura Univ.,23: 103

Grou, R and R. Hamn (1957). Mittelung Uber Due Bestimmunoler Wasser Bindung Des
Muskels .Zeitschrifs Fur Laben Smittie. Untersuchung and for Schung.105 :446

Hanafy, M.A., H.M. Yacout, A. Abdel-Baset, Afaf H. Zidan and T.M. El-Bedawy (2000). Effect of feeding corn stover or sugarcane tops silages on productive performance of dairy cows. Egyptian J.Nutrition and Feeds , 3: (1).

Huber, J.T., R. E. Lichtenwalnter and J.W. Thomes (1973). Factors affecting response of lactating cows to ammonia treated corn silages. J. Dairy Sci., 56:1283.

Hughes, J. (1988). Effect of high strength yeast culture in diets of early-weaned calves. J. Anim. Prod., 46:526.

Hussaini,S.A., F.B.Deartherage and L.E.Kunkle (1950). Studies on meat .11.Observations on relation of Biochemical. Factors to change in tenderness. Fd. Technol., 4: 366

Khattab, H.M., F.A.Salem , M.M._Sayeda and H.M. Nagh. (2003). Effect of Yea-sacc, Lacto-Sacc supplementations and energy levels on performance, rumen activity, some blood performance, rumen activity, some blood constituents and carcass traits in growing sheep. Egyptian J. Nutrition and feeds, 6 (Special issue). The 9th Conference on Anim. Nut.(Part II) Ruminants Nut., 14-17 October, Hurghada, Egypt.

Kholif , S.M. (2001). Effect of biological treatments of low quality roughages on milk yield and composition. Ph. D. Thesis. Fac. of Agric., Ain-Shams, Univ.

Khorshed, M.M.A (2000). Different treatments for improving nutritional quality of some crop residues used in ruminant nutrition. Ph.D. Thesis, Fac. of Agric. Ain Shams Univ., Egypt.

Kobayashi, T., S.O. Oda, A._Takenaka and H. Itabashi (1995). Effects of yeast culture supplement on milk protein yield, ruminal fermentation and blood components in early to mid lactation dairy cows. Bulletin of National Institute of Animal Industry No.55:13-20.

Putman,D.E., C.G.Schwab, M.T.Socha, N.L.Whitehous, N.A.Kierstead and B.D.Garthwaite (1997) . Effect of yeast culture in the diets of early lactation dairy cows on ruminal fermentation and passage of nitrogen fractions and amino acids to the small intestine. J. Dairy Sci., 80: 374.

Rakha, G.M. (1988). Studies on the effect of using agro-industrial by-products on health and production of some farm animals. Ph.D. Thesis, Faculty of Veterinary Medicine, Cairo Univ., Egypt.

Reddy M.R. and G.V.N. Reddy (1991).Effect of fungal treatment of paddy straw on nutrient utilization in complete diets for sheep .Ind. J. Anim. Sci., 12 :1330

Rosenberg, M. and O.Wike (1980). Wood lignin fermentation by white rot fungi. Can. J. Microbiol., 26:12.

SAS (1998). SAS Users Guid: Statistics. Version 2 Edition.SAS Institute, Inc., Cary, NC.

Sharma, R., O.P._Nagia, , M. Gupta and R. Sharma (1998). Effect of yeast culture (*Saccharomyces cerevisiae*)plus growth medium supplementation on rumen fermentation in buffalo calves fed high roughage diet. International . J. of Anim. Sci., 13:2,121-126.

Sohn, H.J. and M.K. Song (1996). Effect of feeding urea diets on the ruminal fermentation characteristics and whole tract digestibility by sheep. Korean J.Anim.Sci., 38:578-588.

Soliman, A.A.M. (1987). Utilization of different types of silage for fattening buffalo calves. M. Sc. Thesis, Fac. of Agric., Al-Azhar, Univ.

Warner, A.C.I. (1964). Production of volatile fatty acids in the rumen.Methods of measurements. Nutr. Abst. and Rev., 34:339.

Wiedmeier, R.D., M.J. Arambel and J.L. Whalters (1987). Effect of yeast culture and *Aspergillus orgzae* fermentation extract on ruminal charachteristics and nutient digestibilty. J. Dariy Sci., 70: 2003.

Yoon, I.K. and M.D.Stern (1996).Effects of *Saccharomyces cerevisiae* and *Aspergillus oryzae* cultures on ruminal fermentation in dairy cows. J. Dairy Sci ., 79: 411.

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الاستفادة الغذائية و أداء النمو للحملان المغذاة علي علائق تحتوي حطب اذرة المعامل كيماويا و بيولوجيا

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استخدمت في هذة الدراسة خمس وعشرون حملا نامى خليط (٠,٢٥ فلندى + ٠,٧٥ رحمانى) عمر ٤ شهور و متوسط وزنها ١٩,٢كجم لمدة ١٨٢ يوما لدراسة تأثير المعاملات الكيماوية والبيولوجية لحطب الاذرة على القيمة الهضمية للمواد الغذائية المختلفة ، معدل أداء نمو الحملان الخليطة ، معدل اداء الكرش ، صفات الذبيحة وكذلك الكفاءة الاقتصادية. قسمت الحيوانات عشوائيا إلى خمس مجاميع (خمس حملان فى كل مجموعة) وغذيت كل الحملان النامية على ٢% من وزن الحيوان علفا مركزا و على إحدى الاعلاف الخشنة حتى الشبع على النحو التالى :

- دريس برسيم (عليقة المقارنة C)
- عيدان الذرة المعاملة بيولوجيا بمخلوط الفطر (*T .herizanum*) والخميرة (*S. cerevisiae*) فى المعاملة T1 .
- عيدان الذرة المعاملة بيولوجيا بالخميرة فقط فى المعاملة T2
- سيلاج عيدان الذرة المعامل بالمفيد ٣% (مولاس وبوريا) فىالمعاملة T3
- اما المعاملة الرابعة T4 فكانت عبارة عن المعاملة T3 مضاف إليها ٥ جم خميرة جافة/ حيوان/ يوميا . وقدر المأكول اليومى، ومعدل الزيادة الوزنية اليومية والكفاءة الغذائية والقيمة الهضمية وبعض مقاييس سائل الكرش بالإضافة إلى تقدير صفات الذبيحة. واظهرت الدراسة النتائج التالية:

- المعاملات الكيماوية والبيولوجية كانت اكثر تفوقا فى تحسين البروتين الخام عن معاملتى سيلاج عيدان الذرة (المعاملة الثالثة والرابعة) بينما اظهر سيلاج عيدان الذرة تفوقا فى تحسين نسبة الدهن الخام مقارنة بالمعاملات البيولوجية (المعاملة الأولى والثانية).وكانت المعاملة T1 متفوقة فى جميع معاملات الهضم (ما عدا معامل هضم المادة الجافة) عن بقية المعاملات التجريبية ، بينما كانت المعاملة T3 الأقل قيمة فى معاملات هضم كل من المادة الجافة والمادة العضوية والبروتين .وكانت القيمة الغذائية فى صورة مجموع المركبات الكلية المهضومة (TDN) و البروتين المهضوم (DCP) مرتفعة معنويا عند مستوى ٥% فى المجموعات المغذاة على العليقة T1(٦٩,٦٤ و ١١,١٠ %) على الترتيب وعليقة الكونترول(٦٩,١٦ و ١١,٦٧%) على التوالى عن بقية العلائق الاخرى المختبرة.
- أظهرت نتائج قياسات سائل الكرش ان قيمة الـ pH وتركيز نتروجين الأمونيا (NH3 –N) أعلى فى المجموعة المغذاة على عليقة T3 ، بينما أرتفع تركيز الأحماض الدهنية الطيارة الكلية معنويا عند مستوى ٥% فى المجموعات المغذاة على العليقة T1 مقارنة ببقية العلائق الاخرى.
- كان معدل الزيادة اليومية أعلى مع المعاملة الأولى (١٣٥جم للرأس) يتبعها مجموعة الكنترول (١٢٦جم للرأس) وسيلاج الذرة مع الخميرة (المعاملة الرابعة ،١٢٣جم للرأس) والمعاملة الثانية (١١٨جم للرأس) ثم المعاملة الثالثة (١١٢جم للرأس) ولقد وجد إن الاختلاف كان معنويا بين المجاميع المختبرة.
- تحسنت الكفاءة التحويلية للغذاء لكل من المادة الجافة ومجموع المركبات الغذائية الكلية المهضومة(منسوبة الى معدل الزيادة الوزنية اليومية) فى الحملان المغذاة على العليقة الأولى يليهاالعليقة الرابعة والثالثة ثم العليقة الثانية على التوالى مقارنة بعليقة الكنترول ، بينما كان معدل التحويل الغذائى فى صورة بروتين مهضوم(منسوب إلى معدل الزيادة الوزنية اليومية) افضل مع الحملان المغذاة على كل من المعاملة الثالثة والمعاملة الرابعة (سيلاج عيدان الذرة أو السيلاج مع الخميرة) يلهما المعاملة الثانية ثم المعاملة الاولى على التوالى مقارنة بمعاملة الكونترول .
- نسبة التصافى على أساس وزن الذبيحة الساخن مع أو بدون الأعضاء الداخلية منسوبة إلى الوزن الصائم كان مرتفع معنويا فى الحملان المغذاة على العليقة الثانية (المعاملة البيولوجية بالخميرة) وكانت نسبتها ٥٢,٧٣%، ٤٥,٤٧% على التوالى مقارنة بمجاميع الحملان المغذاة على العلائق الأخرى ، وقد لوحظ أن اقل نسبة تصافى شوهدت مع الحملان المغذاة على العليقة الثالثة (سيلاج الذرة) وكانت نسبتها ٤٦,١٦% و ٤١,٨٤% على التوالى .
- المعاملات الكيماوية والبيولوجية فى العليقة الأولى والثانية ومعاملات السيلاج فى العليقة الثالثة والرابعة خفضت سعر تكلفة الغذاء منسوبة إلى كجم نمو ، كما تحسنت الكفاءة الاقتصادية مقارنة بعليقة الكنترول .