Egyptian J. Nutrition and Feeds (2009) 12 (2) : 215-227

GROWTH PERFORMANCE OF BARKI LAMBS FED RATIONS WITH DIFFERENT LEVELS OF UNTREATED OR BIOLOGICALLY TREATED WHEAT STRAW.

H. M. Khattab[1]; H. M. El-Sayed[1]; N. E. El-Bordeny[1] O.N. Al-Asfour [2] and M. S. Fadel[3]

[1]Animal Production Department, Faculty of Agriculture, Ain Shams Univ. Cairo, Egypt.

[2]Animal Production Division, Ministry of Agriculture, Damascus, Syria·

[3]Microbial Chemistry Department, National Research Center, Dokki, Giza, Egypt.

(Received 4/9/2008, Accepted 18/7/2009)

SUMMARY

The objective of this study was to investigate effect of using biologically treated wheat straw (TWS) with different levels of concentrate: roughage (C: R) ratio and their interactions on Barki lambs performance. Sixteen Barki lambs with mean weight 27.5 kg± 1.7 were divided into four groups (4 animals each). Each group was assigned randomly to receive one of the following experimental rations for 105 days, R1 contained 75:25 C: R ratio with untreated wheat straw (UWS), R2 contained 75:25 C: R ratio with treated wheat straw (TWS), R3 contained 60:40 C:R ratio with UWS and R4 contained 60:40 C:R ratio with TWS. Digestibility trial was performed during the last month of feeding. The TWS showed higher (P<0.01) CP and ash content and lower (P<0.0.1) OM, CF, NFE, NDF, ADF, ADL, cellulose and hemicillulose contents compared to UWS. The rations containing TWS showed higher (P<0.05) nutrient digestibilities compared to the rations containing UWS, while insignificant differences were observed in TDN and DCP contents. Also the rations containing 75:25 C:R ratio recorded higher values (P<0.05) for DM, OM, CF, NFE, cellulose, NDF and ADF digestibility compared to the rations containing 60:40 C:R ratio. Neither biological treatment, C: R ratio nor their interaction had significant effect on rumen pH. The groups received rations containing TWS had higher rumen ammonia concentration at zero and 6 hrs after feeding compared to the groups received rations containing UWS, the same trends were observed for groups received rations containing 60:40 C:R ratio compared to the groups received rations containing 75:25 C:R ratio at zero,3 and 6 hrs after feeding. The groups received rations containing TWS had higher rumen total volatile fatty acids (TVFA's) concentration at zero, 3 and 6 hrs after feeding compared to the groups received rations containing UWS. The same trends were observed for groups received rations containing 75:25 C:R ratio compared to the groups received rations containing 60:40 C:R ratio at zero,3 and 6 hrs after feeding. Insignificant differences (P> 0.05) were observed in blood serum globulin, urea, creatinin concentrations and A:G ratio as well as ALT and AST activity due to either effects of biological treatment or C: R ratio. Also

Insignificant differences (P>0.05) were observed in initial live body weight, final live body weight, average daily gain , total gain between the groups received rations containing TWS and UWS and between groups received rations containing 75: 25 and 60: 40 C: R ratio as well as among the different experimental groups.

Keywords: *biological treatments, chemical composition, Trichoderma reesei, wheat straw.*

INTRODUCTION

The primary factors limiting the utilization of crop by-products are low digestibility, low protein content and low palatability. Thus, to increase digestibility of crop by-products, it is important to destroy the linkage between cellulose, hemicellulose and lignin or to destroy the compact nature of the tissue, so that lignified tissue is separated to non-lignified one. Mechanical, chemical and biological treatments of the cellulosic materials have been tried for improving the nutrient availability from such materials to the animals (Lyo and Antai, 1988; Singh *et al.*, 1993; McHunt, 1986 and Hunt *et al.*, 1992). Many efforts have been used to remove the lignin and/or to break down the linkages between lignin and carbohydrates to increase their feeding values by biological and biochemical treatments (El-Ashry *et al.*, 2003, Bassuny *et al.*, 2005 and Mahrous and Abou-Ammo, 2005, El-Shafie *et al.*, 2007). Moreover El-Ashry *et al.* (2002 and 2003); Hassan *et al.*, (2005); Belewu (2006) and Allam *et al.* (2006), reported that the biological treatments of poor quality roughage materials led to increase CP content and decrease NDF, ADF, cellulose, hemicellulose and lignin in the treated materials.

Biological treatments of some agricultural by-products become essential not only in order to improve feeding values, but also to decrease depending on grains and concentrate in animal nutrition as a result to world food gap and dramatically increased in food and feed price.

So that, the objective of this study was to investigate the effect of fungal treated wheat straw with different roughage : concentrate ratio on nutrient digestibilities, feeding value, rumen parameters, blood parameters gross performance and economical efficiency of Barki lambs.

MATERIALS AND METHODS

The present study was carried out in the farm station of Faculty of Military Ware located in Nasr City, Cairo and Lab. of Animal Nutrition, Animal Production Department, Faculty of Agriculture, Ain Shams University, Kalyoubia governorate, Egypt.

The biological treatment:

Trichoderma reesei was obtained from Microbial Chemistry Laboratory, National Research Center, Dokki, Giza, Egypt, and used to inoculate a sterilized liquid medium containing 10 g glucose, 3 g ammonium sulfate, 5 g yeast, 5 g sodium chloride and 3 g $MgSO_4.7H_2O$ per litter with a loop of 3 days cultured slants fungus. Culture medium for *Tricoderma reesei* under the farm condition was prepared by adding 15 kg molasses, 1 kg yeast, 5 kg $MgSO_4.7H_2O$, 4 litter phosphoric acids, 12 kg urea and 12 kg ammonium

sulfate to 500 litter of tap water and mixed well, then mixed with the previous prepared medium containing *Tricoderma viride* by rate 10 %. Half ton of wheat straw (WS), was treated with the previous mixed culture and maintained to 14 day under air temperature in shaded place then dried also under air temperature for one week in sunny place.

Experimental diets:

Four complete rations were formulated to be approximately isocaloric and isonitrogenous as follows: R1 contain 75:25 C:R ratio with UWS, R2 contain 75:25 C:R ratio with TWS, R3 contain 60:40 C:R ratio with UWS, R4 contain 60:40 C:R ratio with TWS. The ingredients of the different rations are shown in Table (1).

Table (1): Feed ingredients (%) of experimental rations.

Item	Ration 1	Ration 2	Ration 3	Ration 4
Yellow Corn	40	36	44	37
Soybean	4	9	10	7
Wheat bran	25	25	0	11
Molasses	3	3	3	3
Urea	1	0	1	0
Minerals	2	2	2	2
Untreated WS	25	0	40	0
Treated WS	0	25	0	40
Total	100	100	100	100
C: R ratio	75 :25	75 :25	60 : 40	60 : 40

R1 contained 75:25 C: R ratio with untreated wheat straw (UWS), R2 contained 75:25 C: R ratio with treated wheat straw (TWS), R3 contained 60:40 C:R ratio with UWS and R4 contained 60:40 C:R ratio with TWS.

Experimental animals:

Sixteen Barki lambs 11 months old of 27.5 kg± 1.7 life body weights were assigned randomly into 4 similar experimental groups, (4 animals each). The animals were fed their rations at rate of 3 % of live body weight. Each group was assigned randomly to one of the experimental rations.

Digestibility trial:

The feeding trial lasted for 105 days and a digestibility trial was performed for all animals during the last month of feeding. A grab sample method was applied at which acid insoluble ash (AIA) was used as an internal marker according to Van Keulen and Young (1977) for determining the nutrients digestibility.

Samples collection and analysis:

Samples of rumen fluid were collected from each animal at zero, 3 and 6 hrs post feeding by stomach tube at the end of the digestibility trial, and stored to subsequent analysis. Blood samples were taken from all experimental animals once at the last month of feeding trial at three hrs after morning feeding.

The proximate analysis of the different feedstuffs and rumen fluid total nitrogen and non protein nitrogen (NPN) were analyzed according to the A.O.A.C. *(1995)*. Rumen pH values were measured immediately using pH metter. The rumen NH_3-N concentration was determined according to Conway (1963) .Total volatile fatty acids (TVFA's) was

determined according to Warner (1964). The blood plasma parameters were determined by using Biocon Diagnostik biochemical kits.

Statistical analysis:

The data were analyzed according to statistical analysis system (SAS), (1998). Separation among means was carried out by using Duncan multiple tests, (Duncan, 1955). The following model was used to describe the data:

$Y_{ijk} = \mu + T_i + C_j + (T*C)_{ij} + E_{ijk}$, Where Y_{ijk}: the effect of the observation, μ: the overall mean, T_i: the effect of the treatments, C_j: the effect or C: R ratio, $(T*C)_{ij}$: the effect of interaction and E_{ijk}: the experimental error.

RESULTS AND DISCUSSION

Effect of biological treatments on chemical composition:

Data of Table (2) revealed that the TWS had lower OM, CF, NFE, NDF, ADF, ADL, cellulose and hemicillulose contents compared to UWS. This may be due to the biological treatment, which the fungus depend on carbohydrates including soluble carbohydrate and crude fiber and its fractions as carbon source to produce CO_2 and energy, and use this energy with nitrogen sources in the media to grow up and convert them to microbial protein, consequently decreased OM and increase ash content for TWS compared to UWS. Similar results were reported by (Abo-Eid, 2007 and El-Ashry *et al.*, 2008) working with wide range of poor quality roughage. Moreover, the biological treatment resulted a significant increase in CP content. On the other hand TWS showed higher CP content compared to UWS (3.13 vs. 8.31 %). That could partly due to loss of organic matter as carbohydrates and partly due to the trapping of excess ammonia in the biological medium and its subsequent conversion to fungal protein (Gupta *et al.*, 1988).

These findings are in agreement with those reported by Larwance and Abada (1987); Gupta and Langer (1988); Ali, (1996); Deraz (1996); Abdul-Aziz *et al.* (1997); Gado, (1999); Khorshed (2000); Salem, (2003); Abo-Eid (2007) and El-Ashry *et al.*(2008), who reported that the biological treatment for roughage materials resulted in increase CP content in these materials.

Table (2): Effect of biological treatment on chemical composition of wheat straw (%DM basis).

Item	Wheat straw	Treated wheat straw
Chemical composition, DM basis %		
Dry matter (DM)	93.10	85.34
Organic matter (OM)	82.56	79.21
Ash	17.44	20.79
Crude protein (CP)	3.13	8.31
Crude fiber (CF)	33.34	30.25
Ether extract (EE)	0.45	0.69
Nitrogen free extracted (NFE)	45.64	39.93
Fiber fraction		
NDF	69.12	63.54
ADF	47.56	44.67
ADL	11.36	10.97
Hemicellulose	21.56	18.87
Cellulose	36.2	33.7

With regard to chemical composition of the experimental rations (Table 3) data showed that the rations containing TWS (R2 and R4) had lower content of NDF, ADF, ADL, hemicelluloses and cellulose compared to the rations contained UWS (R1 and R3). This may be due that treated wheat straw had lower NDF, ADF, ADL, hemicelluloses and cellulose. Ration 4 (R4) recorded the highest value of ash content and the lowest value of OM content, this may be attributed to effect of the highest level of treated WS (40% of the ration), which the treated WS characterized by higher content of ash and lower level of OM Abo-Eid (2007) and El-Ashry *et al.*,(2008).

Table (3): Chemical composition of experimental rations (% on DM basis).

Items	75:25 C:R ratio		60:40 C: R ratio	
	R1	R2	R3	R4
Dry matter (DM)	90.27	89.17	88.85	89.07
Organic matter (OM)	82.82	82.28	80.35	74.64
Ash	17.18	17.71	19.64	25.35
Crude Fiber (CF)	17.68	16.83	17.69	18.10
Crude Protein (CP)	17.96	18.53	18.04	18.31
Ether Extract (EE)	2.94	2.75	2.40	2.60
Nitrogen free extracted (NFE)	44.24	44.17	42.22	35.63
Fiber fraction				
NDF	53.34	54.83	55.49	52.49
ADF	43.15	33.75	37.35	33.21
ADL	8.86	6.87	7.36	6.93
Hemicellulose	21.01	10.19	19.21	18.14
Cellulose	34.25	26.78	29.99	26.28

R1 contained 75:25 C: R ratio with untreated wheat straw (UWS), R2 contained 75:25 C: R ratio with treated wheat straw (TWS), R3 contained 60:40 C:R ratio with UWS and R4 contained 60:40 C:R ratio with TWS.

Effect of treatments on digestibility coefficients and nutritive values:

Data of Table (4) clearly indicate that mean values of DM,OM, CF, CP, EE, NFE, NDF, ADF cellulose and hemicellulose digestibility coefficients showed significant increase ($P<0.05$) for groups fed rations containing TWS. This may be attributed to the biological treatment for wheat straw, which may lead to 1) the fungus produces powerful extra cellular fiber degrading enzymes resulted in exhibit promising properties for the decomposition of lignin-cellulose containing materials and increasing the availability of cellulose, so that it is digested easily. White rot fungi are able to increase the digestibility of plant residues without chemical and physical pretreatment through selective lignin degradation (Zadrazil, 1984) 2) as a result to break down the lingo-celluletic pond the attached nitrogen (indigested CP) get free and used by the fungus to grow and produce fungus protein (easy digested CP). 3) Also decomposition of cellulose and hemicellulose containing materials and converting them to metabolic products which increase the simple carbohydrates. 4) Break down the plant cellular wall and get its contents free to be digested in the rumen. 5) Activity of the cellulitic enzyme produced by fungus in the rumen and increase fiber digestibility. 6) The fungus may produce stimulating factors lead to increase rumen bacteria and fermentation.

Table (4): Effect of biological treatments on nutrient digestibility coefficient.

Item	Treatments		C:R Ratio		G1	G2	G3	G4	±SE
	Untreated	Treated	75:25	60:40					
DM	63.07 ^{B}	66.37^{A}	65.93^{A}	63.51^{B}	65.03	66.82	61.09	65.91	0.39
OM	66.34 ^{B}	68.60^{A}	68.99^{A}	66.04^{B}	67.58	69.97	64.84	67.24	0.27
CF	52.75 ^{B}	56.24^{A}	55.07^{B}	53.93^{A}	52.88	54.99	52.64	57.51	0.68
EE	58.11 ^{B}	62.28^{A}	60.68	59.71	57.83	63.52	58.39	61.04	0.88
CP	68.3 ^{B}	72.22^{A}	70.53	69.99	68.67	72.37	67.93	72.06	0.76
NFE	69.88 ^{B}	71.56^{A}	72.97^{A}	68.46^{B}	71.76	74.18	67.99	68.93	0.38
NDF	56.27 ^{B}	59.63^{A}	63.76^{A}	52.13^{B}	62.67	64.86	49.86	54.39	0.41
ADF	54.17 ^{B}	57.28^{A}	63.86^{A}	47.59^{B}	63.19	64.54	45.15	50.02	0.42
Cell	54.64 ^{B}	57.31^{A}	63.96^{A}	47.99^{B}	63.81	64.12	45.47	50.51	0.42
Hemcellulose	60.31 ^{B}	64.18^{A}	63.79	60.69	63.63	65.94	58.98	62.40	0.38
Feeding Values									
DCP	12.29	13.30	12.87	12.72	12.33	13.41	12.25	13.19	
TDN	55.32	55.42	58.31	52.58	57.25	59.36	52.42	51.73	

- G1 fed diets contained 75:25 C: R ratio with untreated wheat straw (UWS), G2 fed diets contained 75:25 C: R ratio with treated wheat straw (TWS), G3 fed diets contained 60:40 C:R ratio with UWS and G4 fed diets contained 60:40 C:R ratio with TWS.
- Means with different superscripts in the same raw are significantly (P<0.01, A, B, C and D) different

Also the rations containing 75:25 C:R ratio showed higher values (P<0.05) in DM, OM, CF, NFE, cellulose, NDF and ADF digestibility as compared to the rations containing 60:40 C:R ratio. This may be attributed to that the rations containing 75:25 C: R ratio contains high level of concentrate materials, which characterized by higher digestibility and led to increase total ration digestibility. In general it can be summarized that the groups fed rations containing TWS recorded higher values in nutrient digestibility compared to those fed ration containing UWS (G2 Vs G1 and G4 Vs G3). The highest values of all nutrients digestibility except EE digestibility were recorded for G2 followed by G4 then G1, while the lowest values were recorded for G3. These results may be attributed to the ration formulation (concentrate level and inclusion TWS or UWS in the ration).

Slightly higher (P>0.05) TDN and DCP contents were noticed for rations containing TWS compared to rations containing UWS (Table 4). This may be attributed to that the rations containing TWS recorded higher nutrients digestibility compared to the ration containing UWS. On the other hand, the rations containing 75:25 C: R ratio recorded higher (P<0.05) TDN values and slightly higher (P>0.05) DCP content compared to the ration containing 60:40 C: R ratio. This may be due to the higher level of concentrate materials, which is characterized by its higher digestibility and led to increase total ration digestibility consequently increase feeding values.

Also, data of Table (4) indicated that G2 and G4 had higher DCP content compared to G1 and G3. This may be due to that rations of G2 and G4 showed higher in CP digestibility compared to G1 and G3 as a result to inclusion of TWS in their rations. The highest (P<0.05) value of TDN content was recorded for G2 followed by G1 then G3 while the lowest (P<0.05) value was recorded for G4. These results are in agreement with El-Ashry *et al.* (2003); El-Sayed *et al.* (2002); Gado *et al.* (2006); Hassan *et al.* (2005); Khorshed (2000) Mahrous (2005) and Allam *et al.* (2006).

Effect of biological treatment on rumen liquor parameters:

The data of Table (5) clearly indicated insignificant differences were observed due to the effect of either the biological treatment or C: R ratio on rumen liquor pH at zero, 3 and 6 hrs after feeding. These results are in agreement with Mould and Orskove (1983), Adams and Kartecher, (1984), El Ashry *et al.*, (1997, 2003) and Khorshed (2000).

Data of Table (5) indicated that the groups fed rations containing TWS had higher rumen liquor ammonia concentration at zero and 6 hrs after feeding compared to the groups fed rations containing UWS. While insignificant differences were observed at 3 hrs after feeding. This may be due to effect of inclusion TWS in their ration, which urea was added to the media during the treatment and led to increase the percent of non protein nitrogen in the rations containing TWS compared to the ration containing UWS. Also the groups received rations containing 60:40 C: R ratio had higher ($P<0.05$) rumen ammonia concentration compared to the groups received ration containing 75:25 C: ratio at zero, 3 and 6 hrs after feeding. The present results agree with Newbold *et al.* (1996), Khorshed (2000), Gado *et al.* (2006), El-Aziz (2007), and El-Shafie *et al.* (2007) who reported that the reduction of ammonia concentration in rumen liquor appeared to be the result of increased incorporation of ammonia into microbial protein.

The values of rumen total volatile fatty acids (TVFA's) (m.eq/dl) (Table, 5) for groups fed ration containing TWS were slightly lower ($P>0.05$) than the groups fed ration containing UWS at the different times. The values for groups fed ration containing 75:25 C:R ratio were higher ($P<0.05$) than the groups fed ration containing 60:40 C:R ratio at zero time after feeding, while insignificant differences were observed at 3 and 6 hrs after feeding.

On the other hand insignificant differences were recorded in rumen liquor pH value, ammonia and TVFA's concentration among the different experimental groups at zero, 3 and 6 hrs after feeding.

Concerning to effect of sampling time, the values of rumen total volatile fatty acids and ammonia concentration started low at zero time then increased ($P>0.05$) to the maximum level at 3 hrs after feeding then decreased ($P>0.05$) again at 6 hrs after feeding. On the contrary the mean value of rumen pH started high at zero time then decreased ($P<0.05$) at 3 hrs, then increased ($P>00.05$) at 6 hrs after feeding. This may be attributed to 1) nonstructural carbohydrates degradation started low then increased with the time and reaches the maximum level at about 3 hrs after feeding then decreased up to the next meal. 2) Proteins degradation and NPN hydrolysis started low then increased with the time increased and reaches the maximum level at about 3 hrs after feeding then decreased up to the next meal (Reddy and Reddy, 1989). 3) Fermentation process of both nonstructural and structural carbohydrates and production of volatile fatty acids which increased with proceeding time so that affected the pH to some limit until they were proportionally and relatively absorbed from the rumen wall resulting in an increase in pH value.These results might be attributed to more utilization of the dietary energy and positive fermentation in the rumen of lambs fed biological treated wheat straw. Moreover, the TVFA's were found to correlate significantly and negatively with rumen liquor pH values which agree with Muller, (1973). Also, it is worthy to notice that the balance between NH_3-N and TVFA's concentration reflected the pH values in the rumen liquor. This agree with Newbold *et al.*, (1996), Khorshed (2000), Gado *et al.* (2006), El-Aziz (2007) and El-Shafie *et al.* (2007).

Table (5): Effect of Biological treatments on some rumen parameters of lambs fed experimental rations.

Item	Treatments		C: R ratio		G1	G2	G3	G4	Overall Means	±SE
	untreated	treated	75:25	60:40						
					pH					
0 hr	6.74	6.70	6.74	6.78	6.65	6.83	6.82	6.72	6.76^{A}	0.017
3 hrs	6.16	6.19	6.29	6.06	6.25	6.32	6.07	6.05	6.17C	0.017
6 hrs	6.54	6.54	6.56	6.51	6.5	6.62	6.57	6.45	6.54B	0.017
Overall Means	6.48	6.50	6.53	6.45	6.47	6.59	6.49	6.41	---	0.07
Ammonia mg/dl:										
0 hr	18.39^{B}	18.92^{A}	17.94^{B}	19.38^{A}	17.57	18.30	19.22	19.55	18.67^{C}	0.07
3 hrs	20.29	20.61	19.47^{B}	21.44^{A}	19.07	19.87	21.52	21.35	20.45^{A}	0.07
6 hrs	19.07^{B}	19.65^{B}	18.72^{B}	20.00^{A}	18.33	19.13	19.82	20.18	19.36^{B}	0.07
Overall Means	19.25^{B}	19.64^{A}	19.37^{B}	20.27^{A}	18.32	19.10	20.18	20.36	---	0.16
TVFA's m.eq/dl :										
0 hr	8.66	7.99	8.76	7.88	9.35	8.17	7.97	7.80	8.32^{C}	0.14
3 hrs	10.81	10.51	10.85	10.05	11.27	10.42	10.42	9.67	10.45^{A}	0.14
6 hrs	9.36	8.94	9.64	8.73	10.00	9.25	8.72	8.67	9.15^{B}	0.14
Overall Means	9.63	8.99	9.74	8.88	10.21	9.27	9.04	8.72	---	0.36

- G1 fed diets contained 75:25 C: R ratio with untreated wheat straw (UWS), G2 fed diets contained 75:25 C: R ratio with treated wheat straw (TWS), G3 fed diets contained 60:40 C:R ratio with UWS and G4 fed diets contained 60:40 C:R ratio with TWS.
- Means with different superscripts in the same raw are significantly ($P<0.01$, A, B and C) different. Means with different superscripts in the same column (for overall mean) are significantly ($P<0.05$, A, B and C) different.

Effect of biological treatment of wheat straw on some serum blood parameters:

Data of Table (6) showed that lamb groups fed rations containing TWS had slightly higher in blood serum total proteins and significantly higher in albumin concentration compared to those fed rations containing UWS. On the other hand, the groups fed ration containing 75:25 C:R ratio were higher in blood serum total proteins and albumin than those received ration containing 60:40 C:R ratio. These results show a healthy condition of animal and agree with those obtained by El-Ashry *et al.* (1997, 2002 and 2003) and El-Sayed *et al.*,(2002).

Moreover, insignificant differences were observed in blood serum globulin, urea, creatinine concentrations and A: G ratio as well as ALT and AST activity due to neither the effect of biological treatment nor effect of C: R ratio. The present results of plasma AST are in line with the normal values of those reported by Blinco and Dye (1958) who found that the values of serum AST activity ranged from 19 to 99 (units/ml) for normal active cells. Also, the present results are in good agreement with El-Ashry *et al.*, (1997, 2002 and 2003) and El-Sayed *et al.* (2002).

Total proteins and albumin concentrations were higher ($P<0.05$) for G1 and G2 than G3, while G4 insignificantly differed with other groups. On the other hand insignificant differences ($P>0.05$) were observed in blood serum globulin, urea, creatinine concentrations and A: G ratio as well as ALT and AST activity among the different groups. These results agree with Abd El-Aziz *et al.* (1993) El-Ashry *et al.* (1997), El-Sayed *et al.* (2002) Khorshed (2000) and Kholif *et al.*, (2005).

Table (6): Effect of Biological treatments of wheat straw on some serum blood parameters of experimental lambs.

Item	Treatment		C:R Ratio		G1	G2	G3	G4	±SE
	Untreated	Treated	75:25	60:40					
Total Protein(g/dl)	6.99	7.14	7.20^{A}	6.93^{B}	7.15^{A}	7.25^{A}	6.84^{B}	7.03^{AB}	0.06
Albumin (g/dl)	3.74^{B}	3.87^{A}	3.89^{A}	3.72^{B}	3.85^{A}	3.94^{A}	3.63^{B}	3.81^{AB}	0.04
Globulin (g/dl)	3.25	3.26	3.30	3.21	3.29	3.31	3.21	3.22	0.05
A:G Ratio	1.15	1.19	1.18	1.16	1.16	1.19	1.13	1.18	0.02
UREA (mg/dl)	33.74	33.62	34.32	33.05	34.44	34.19	33.04	33.05	0.49
AST (units/l)	11.51	11.38	11.4	11.5	11.04	11.75	11.98	11.02	0.3
ALT (units/l)	32.73	32.43	33.07	32.09	33.33	32.80	32.13	32.05	0.83
Creatinine (mg/dl)	1.57	1.58	1.58	1.58	1.57	1.58	1.57	1.58	0.05

- G1 fed diets contained 75:25 C: R ratio with untreated wheat straw (UWS), G2 fed diets contained 75:25 C: R ratio with treated wheat straw (TWS), G3 fed diets contained 60:40 C:R ratio with UWS and G4 fed diets contained 60:40 C:R ratio with TWS.
Means in the same row with different superscript are significantly (P<0.05 A and B) different.
AST: Aspartate AminotrAnsferase.
ALT: Alanin Aminotransferase.

Effect of feeding biologically treated wheat straw in the ration on growth performance:

Data of Table (7) showed insignificant differences (P>0.05) in initial and final live body weights, average daily gain and total gain either between the groups fed ration containing treated or untreated wheat straw or between groups fed ration containing 75: 25 or 60: 40 C: R ratio as well as among the different experimental groups. On the other hand the groups fed rations containing TWS showed better (P<0.05) in feed conversion as DM, TDN, CP and DCP compared to the groups fed rations containing UWS. Also the groups fed rations containing 60:40 C: R ratio were better (P<0.05) in feed conversion than the groups received rations containing 75:25 C:R ratio. The higher (P<0.05) values of feed conversion as DM, TDN, CP and DCP were recorded for G1 followed by G2 then G3, while the lowest values were recorded for G4, and the differences among the groups were not significant. These results indicate that biological treatments may be enhancing feed conversion. The present results agree with Beauchemin,(2003), Deraz, (1996) and El-Markby (2003) who found groups fed biologically treated rice straw were the most efficient groups in feed conversion.

Table (7): Effect of feeding biologically treated wheat straw in rations on growth performance and feed conversion of experimental lambs groups.

Item	Treatment		C:R Ratio		G1	G2	G3	G4	Overall Means	±SE
	Untreated	Treated	75:25	60:40						
Initial live Body weight (Kg)	27.42	27.05	27.13	27.34	27.19	27.08	27.65	27.03	27.24	1.21
Final live Body weight (Kg)	44.99	45.01	45.06	44.93	44.87	45.25	45.10	44.76	45.00	1.45
Average Daily gain Kg	0.16	0.17	0.17	0.167	0.16	0.17	0.16	0.16	0.16	0.01
Total Gain (Kg)	17.56	17.95	17.92	17.59	17.67	18.17	17.45	17.72	17.75	0.46
Feed Conversion										
DM Conversion (Kg/Kg gain)	7.49	7.41	7.32	7.58	7.46	7.19	7.52	7.64	7.45	0.21
TDN Conversion (Kg/Kg gain)	4.14	4.11	4.27	3.98	4.27	4.26	4.01	3.95	4.12	0.11
CP Conversion (Kg/Kg gain)	1.34	1.36	1.33	1.37	1.34	1.33	1.35	1.39	1.35	0.03
DCP Conversion (Kg/Kg gain)	0.92	0.98	0.94	0.96	0.92	0.96	0.92	1.00	0.95	0.02

CONCLUSION

Biological treatments could be used successfully to enrich chemical composition and improve the nutritive value of agricultural by-products. It is possible to use treated WS with high percent reached to 40% in the ruminant rations without any adverse effect on rumen parameters, average daily gain and feed conversion.

REFERENCES

Abd El-Aziz, A. A.; M. E. Lashin, N. El-Oksh and R. T. Fouad (1993) Effect of some mechanical treatment and additive on nutritional value of corn stalks III. Blood rumen parameters. J. Agric. Sci. Mansoura Univ. 18(1): 46.

Abdul-Aziz, G. M.; Y. E. El-Talty and M. A. Aly (1997). Biological treatments of straws in animals nutrition. Egyptian J. Nutrition and Feeds., 1: (Special issue): 225.

Abo-Eid, H. A. (2007). Effect of biological treatments of some crop residues on their nutritive values. Ph. D. Thesis, Faculty of Agriculture. Ain Shams University.

Adams, D.C. and R.J. Kartecher (1984). Effect of forage intake on rumen ammonia, pH liquid volumen and liquid dilution rate in beef cattle. J. Anim. Sci. 58:, 3: 708.

A.O.A.C. (1995). Official Methods of Analysis. 15th ed. Association of Official Analytical Chemists. Arlongton, Virginiall USA.

Ali, M. A. (1996). Up-grading straws biologically for animal feeding. M. Sc. Thesis, Fac. Of Agric. Cairo Univ.

Allam, Sabbah, M., T. M. Al-Bedawi, Hanaa H. El-Amary and Sheren H. Mohamed (2006). Improving sugar beet pulp through biological treatment and its use in sheep ration. Egyption J. Nutrition and feeds 9 (2) : 235.

Bassuny, S. M.; A. A. Abdel-Aziz., H. I. Abd El- Fattah and M. Y. S. Abdl-Aziz., (2005) Fibrous crop by-products as feed – 4 Effect of biological treatment of rice and bean straws on chemical composition, digestibility and some ruminal and blood constituents of sheep. Egyption J. nutrition and feeds. 8 (special Issue): 541.

Beauchemin, (2003). Influence of fibrolytic enzymes on the hydrolysis and fermentation of pure cellulose and xylan by mixed ruminal microorganisms in vitro. J. Anim. Sci. 2003. 81: 1040.

Belewu, M.A. (2006). Conversion of masonia tree sawdust and cotton plant by product into feed by white rot fungus (*Pleurotus Sajor caju*). African Journal of Biotechnology Vol. 5 (6): 503.

Blinco, C. and W.B. Dye (1958). Serum transaminase in white muscle disease J· Animal Sci· 17:224·

Conway, E.F. (1963). Modification analysis and volumetric error. Rev. Ed. LookWood. London.

Deraz, T.A. (1996). The production of microbial protein from some agricultural wastes and its utilization in ruminant. Ph. D. Thesis, faculty of Agric. Ain Shams university.

Duncan, D.B. (1955). Multiple range and multiple F-test. Biometrics, 11: 1- 42.

El-Ashry, M.A.; M.F. Ahmed, S.A. El-Saadany, M.E.S. Youssef, I.V. Gomaa and T.A.A. Deraz (1997). Effect of mechanical vs. mechano-chemical or mechano-biological treatment of crop-residues on their use in ruminant rations: Digestibility, Nitrogen balance and some blood and rumen liquor parameters of sheep. Egyptian J. Nutrition and feeds I: (Special Issue): 173.