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EFFECT OF CHEMICAL AND BIOLOGICAL TREATMENTS OF SOME CROP-RESIDUES ON THEIR NUTRITUVE VALUE : 3- DIGESTION COFFECIENT, RUMEN AND BLOOD SERUM PARAMETERS OF GOATS.

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SUMMARY

Four digestibility and nitrogen balance trials were conducted on Balady goats fed rations containing 25% of biologically treated cotton stalks. 25% wheat straw and 50% concentrate feed mixture. Some rumen liquor and blood parameters were determined.

Results indicated that. use of biological treatments (specially combined *Trichoderma viride* and *Saccharomyces cerevisiae*) in goats rations is useful and did not cause any abnormal condition on rumen activity. liver and kidney functions and animal performance as well.

Keywords: *biological treatments. cotton stalks. goats. digestibility trial. rumen and blood serum parameters.*

INTRODUCTION

Cotton and cereal crops generate large amounts of organic agricultural waste in many countries. Cereal straws have an economical value and their residues are utilized mainly in cattle production as feedstuff and/or as bedding (Adamovic *et al.*, 1998).

Cotton is one of major crop in Egypt. The growers use the seeds and the fibers of cotton. but the cotton stalks (straws) have no use for the farmer. It cannot be used as animal bedding like other straw because it is not efficient water absorbent. and it cannot be fed to cattle or sheep because its high lignin content which prevents even ruminants from utilizing its Fibers. So. this investigation had been done to find the better way of using these large amounts of unusable cotton stalks in Egypt.

MATERIALS AND METHODS

This study was carried out at the Experimental Station of Milk Replacer Research Center, Faculty of Agriculture, Ain Shams University. Shoubra El Kheima. Kalubeya Province. Egypt. to study the effect of some biological treatments on improving cotton stalks by affecting its chemical composition.

Scaling up the biological treatment of cotton stalks:

The above polyethylene bags containing fungal treated cotton stalks were used to inoculate 2 Kg (10 % w/w) moistened cotton stalks and left to ferment for 7 days. The resulted fermented cotton stalks was mixed in 20 Kg moistened cotton stalks with basal medium mixed with 0.5 % (v/w) yeast inoculum in polyethylene bags. All the treatments were carried out in temperature adjusted room at 32 °C ± 2

for 21 days. At the end of fermentation period the contents of the bags were air dried (about 8 - 10 % moisture). The air dried fermented cotton stalks were packaging till used in digestibility and nitrogen balance trail on goats.

Four digestibility and N-balance trials were conducted using three adult male goats per each treatment to determine the nutrient digestibilities and the nutritive value of four-experimental rations. The formulation of the experimental rations and their chemical composition are shown in Table (1).

The animals were weighed at beginning and end of each trial. Each trial lasted for 35 days from which 28 days were considered as a preliminary period, followed by 7 days as a collection period. Animals were confined in individual metabolic crates during the experimental period. The feed stuffs (experimental rations) were offered ad-libitum. Water was offered three times a day (at 8 a.m., 1 p.m. and 5 p.m.). Feces, urine and feed residues were quantitatively collected.

Table 1. The formulation of the experimental rations and their chemical composition (%).

Component	Treatments*			
	T1	T2	T3	T4
Conc. Mixture	50	50	50	50
Wheat straw	25	25	25	25
Cotton stalks	25	25	25	25
DM	91.92	91.92	92.19	91.60
Ash	10.35	10.71	10.73	10.83
OM	89.65	89.29	89.27	89.17
CP	11.21	13.18	12.93	13.15
CF	27.78	26.25	24.94	25.34
EE	02.59	02.55	02.64	02.57
NFE	48.07	47.31	48.76	48.11

T1: Control (untreated cotton stalks).
T2: Fungal treatment (treated cotton stalks with *T. viride).*
T3: Yeast treatment (treated cotton stalks with *S. cereviciae*).
T4: Combined fungi and yeast treatment [treated cotton stalks with mixture fungi and yeast media (50%:50%)].

Chemical composition of dietary feed samples, feed residues and feces were analyzed for DM, CP, EE, CF and ash content according to the A.O.A.C. (1990) and fiber fraction (NDF, ADF, ADL, hemicellulose and cellulose) according to Goering and Van Soest (1970) by using triplicates for each determination. Urinary-N content also was analyzed according to the A. O. A. C. (1990).

Rumen liquor sampling and analysis:

Three rumen liquor samples were collected at the end of collection period from each animal at the morning just before feeding (0 hr), 3 hrs and 6 hrs post feeding, using a rubber stomach tube. Rumen liquor was strained through 4 layers of cheese cloth for immediate determination of rumen pH using pH meter (EH-7010) and ammonia nitrogen according to Con-Way (1962). Then the liquor was stored in deep freezer at (-20 °C) until chemically

analyzed using dried glass bottles with adding 0.5 ml toluene and 1 ml paraffin oil to each sample.

Ruminal total volatile fatty acids (TVFA's) was determined in the strained rumen liquor according to Warner (1964). Ruminal total nitrogen and non protein nitrogen were determined by the modified semi-micro Kjeldahl digestion method (A. O. A. C., 1990).

Blood serum sampling and analysis:

Blood samples were taken from Jugular vein at the end of the collection period from each animal at three times, at the morning just before feeding (0 hr), 3 hrs and 6 hrs post feeding. Blood was left at room temperature for 45 – 60 min then centrifuged for 30 min. at 4000 r.p.m. Serum was separated into clean dried glass vials (5 – 7 ml) and stored frozen (-20 °C) until analysis, total protein as described by Armstrong and Carr (1964) and albumin as described by Doumas *et al.* (1971). Globulin was determined by difference and albumin/globulin ratio (A/G ratio) was calculated. Serum urea, creatinine and transaminases (GPT, GOT) were determined as described by Reitman and Frankel (1957).

Statistical Analysis:

The data were analyzed according to Statistical Analysis System User's Guide, (SAS) (1998). Separation among means was carried out by using Duncan multiple test, (1955).

Data of digestibility coefficients and nitrogen balance were analyzed according to one way classifications.

Where the model was:

$$Y_{ij} = \mu + T_i + e_{ij}$$

Data of rumen and blood parameters were analyzed according to factorial design (three way classification).

where the model was:

$$Y_{ijkl} = \mu + T_i + An_{j(i)} + S_k + (T*S)_{ik} + e_{ijkl}$$

as $An_{j(I)}$ expressed the animal within treatment, S expressed the sampling time, with the interaction between treatment and sampling time.

RESULTS AND DISCUSSION

Effect of biological treatments on apparent digestibility coefficients (%):

All biological treatments (T2, T3, and T4) increased significantly ($P<0.01$) the values of nutrients digestibility coefficients compared to control (Table, 2). Ration containing combined fungi and yeast treated cotton stalk (T4) showed the highest ($P<0.01$) digestion coefficients for all nutrients compared with others. Followed by of T2 which contained a fungi treated cotton stalks. However, the lowest values were recorded for T3 which contained yeast treated cotton stalks.

Table (2): Effect of biological treatments on apparent digestibility coefficients of different nutrients by goats.

TRT*	Digestion coefficients									
	DM	OM_d	CP	CF_d	EE_c	NFE_d	NDF_d	ADF_d	Hem_d	$Cell_d$
T1	56.7	60.9_b	55.2	51.1_b	58.7_b	69.2_b	60.2_b	55.2_b	55.5_b	59.1_b
T2	68.8	72.3_c	70.5	62.1_c	70.3_b	82.5_c	69.9_c	62.7_c	65.3_c	71.9_c
T3	62.9	69.8_a	68.1	58.2_a	69.9_a	80.4_a	66.6_a	59.5_a	61.4_a	69.0_a
T4	70.7	75.0	73.9	65.7	76.5	85.2	71.9	65.8	67.6	75.3
Pescntage of improvement of nutrients digestibility of the treated rations										
T2	21.30	18.79	27.65	21.15	19.76	19.2	16.04	13.58	17.65	21.16
T3	10.89	14.65	23.32	13.79	19.08	16.18	10.63	07.78	10.63	16.75
T4	24.74	23.24	33.88	28.57	30.32	22.92	19.43	19.20	21.80	27.36

a, b, c and d: Means in the same column or raw with different superscripts are significant ($P < 0.01$).
*: Different biological treatments when goats consuming a ration based on cotton stalks treated with: T1= untreated cotton stalks (Control), T2= fungi, T3= yeast, and T4= combined fungi and yeast.

Similar trend was reported by Zadrazil (1984) and Masaaki *et al.* (1992) when used fungi and Ward and Perry (1982) when used the same *T. viride* funges with corn cobs as they attained increase in digestibility of DM and NFE. Lunger *et al.* (1982) also, Ahuja *et al.* (1986) found that, values of nutrient digestibility coefficient of 61.6, 66.7, 48.7, 63.7 and 71.4% for DM, CP, CF, EE, and NFE respectively, when they used wheat straw spent (30%) in sheep ration.

In this study, which is in harmony with Zadrazil, (1975) and Walli *et al.* (1991), the white rot fungi exhibited promising ability for the decomposition of lignin-cellulose containing materials and for increasing the availability of carbohydrates and production of fungal protein. So, the feed value of biological treated crop-residues were increased. *Trichoderma viride* degraded hemicellulosses preference to cellulose, which resulted in a higher rate and extent of cell wall digestion in ration contained biological treated cotton stalks than control (Table 2).

The increased digestibility of EE and cellulose after the biological treatments can be considered as a consequence to the increased availability of these materials due to fungal attache to the lignin. Some changes can be also associated with the solubilization of some cotton stalks components (Calzada *et al.* 1987).

Results indicated that biological treatments (T2, T3 and T4) were very effective in improving nutrients digestibility. It is worth to note that T4 was superior than all treatments in improving all nutrients digestibilities (DM, OM, CP, CF, EE, NFE, NDF, ADF, hemicellulose and cellulose) followed by T2 then T3, (Table 2). The digestibility values of T2 improved after decay, either for solubilization or increased biodegradability of cotton stalks cell wall components. This result agreed with those of Eduardo *et al.* (1986) and Calzada *et al.* (1987).

The improvement in nutrients digestibility was increased when goats were fed on ration contained cotton stalks fermented with a mixed culture of *T. viride* and *S. cerevisiae*. This observation was in substantial agreement with that of Wiedmeier *et al.* (1987). There was no evidence to show that fungi can supply stimulatory factors to rumen microbes. Therefore its effect could be through participate with cellulolysis. However, yeast is not a cellulolytic agent. In addition, Chandemana and Offer (1990) reported a possible explanation for the improvement

in nutrient digestibility in the form of NDF digestibility that yeast (*S.cerevisiae*) might supplied stimulatory growth factors such as B vitamins and / or iso-fatty acids which affected rumen cellulolytic microbes by improving the buffering number of liquor or by removing competitive substrate substances derived from polysaccharide degradation, especially starch. Rosenberg and Wike (1980) suggested that further improvements might be obtained by exploiting the synergistic activities of mixed cultures. Mutants with high phenol oxidase activity (Ander and Eriksson, 1975) seem particularly promising. The combination with *S. cerevisiae,* probably provided stimulatory factors for rumen microbes, while with white rot fungi probably produced phenol oxidizes and /or some celluloses that made most beneficial. These results were in agre - ment with those of Agosin and Odier (1985) and Galal (1998)

Nitrogen balance (g/day):

Data of nitrogen balance are presented in Table (3). All treatments showed positive nitrogen balance. The estimated daily nitrogen balance ranged from (+3.01) to (+6.85) g/head/day. All biological treatments had significantly ($P<0.05$) improved nitrogen balance compared to the control groups. Combined fungi and yeast treatment was of more pronounced effect on improving N-balance. Such improvement was not significant, compare with other treatments, when measured as g / day while significant when related to percent of N-intake.

Table 3. Effect of biological treatments on nitrogen intake, excretion and balance (g/day) in goats.

Item	Treatments			
	T1	T2	T3	T4
No. of animals	3 b	3 a	3 a	3 a
N-intake (g/d)	15.84	18.34	18.01	18.51
N-excretion (g/d)				
Fecal	7.10	5.43	5.73	4.90
Urinary	5.73	7.00	6.57	6.76
Total excretion	12.83 b	12.43 a	12.30 a	11.66 a
N-balance (g/d)	3.01 c	5.91 b	5.71 b	6.85 a
N-balance % of N-intake	19.00	32.22	31.70	37.01

a, b and c: Means in the same column or raw with different superscripts are significant ($P<0.01$).

The improved positive nitrogen balance is in agreement with Langer *et al.* (1982) and Bakshi and Langar (1991). Marwaha *et al.* (1990) conducted a feeding trial with growing Jersy calves fed fungal treated wheat straw and found that retained nitrogen was 27.7% of N-intake. This result is lower in nitrogen retained compared with the present study. Also. Singh *et al.* (1990) and Walli *et al.* (1991) reported a positive N-balance when they fed calves on fungal treated wheat straw. The present observation is in agreement with Kakkar *et al.* (1990) and El-Ashry *et al.* (1997).

Generally, the superiority in N-retention due to a specific ration is affected by several factors such as possible production of microbial protein synthesis, increased presence of fermentable energy (Hagemeister *et al.* 1981), differences in availability of fermentable energy (Tagari *et al.* 1976), variability in nitrogen that might escape fermentation from the rumen. an increased utilization of ammonia in the rumen (Holzer *et al.* 1986) and the

effect of the free fats in protein synthesis (Sutton *et al.* 1983).

Rumen liquor parameters:

Values of goats, rumen liquor parameters for the experimental treatments throughout different sampling times are shown in table (4).

Table 4. Effect of different treatments of roughage on some rumen liquor parameters at different sampling times.

Treatments	Parameters					
	pH	TVFA's (m. eq/dl)	NH3-N (mg/dl)	Total-N (mg/dl)	NPN (mg/dl)	True protein-N (mg/dl)
T1	6.91^{a}	7.15^{d}	26.85^{d}	101.8^{c}	31.70^{c}	70.06^{b}
T2	6.48^{bc}	8.62^{c}	28.81^{c}	107.4^{b}	35.34^{b}	72.10^{a}
T3	6.37^{c}	8.92^{b}	30.42^{b}	108.5^{a}	38.02^{a}	70.34^{a}
T4	6.52^{b}	10.18^{a}	32.39^{a}	107.9^{b}	37.04^{a}	71.25^{a}
Sampling time						
Zero hrs	6.78^{a}	6.93^{c}	28.63^{b}	102.6^{c}	32.80^{c}	69.83^{c}
3 hrs	6.48^{c}	9.53^{a}	29.62^{a}	108.0^{a}	36.30^{a}	71.81^{a}
6 hrs	6.63^{b}	8.39^{b}	28.68^{b}	105.1^{b}	34.26^{b}	70.89^{b}

Results indicated that ruminal pH was significantly lower for biologically treated cotton stalks (T2. T3 and T4) than control (T1). This suggests more rapid breakdown of the crude fiber or fiber fraction in the treated groups. Campbell *et al.* (1988) found that. change in rumen pH could due to plan of feeding and reduction in fiber digestion. However, the crude fiber content in the rations used in this study (around 62 %) was apparently greater enough to depress ruminal pH. In addition there were significant ($P<0.01$) differences among CF digestibilities of the treatments (Table 2) which suggest the high digestion of CF as a reason for changing rumen pH. Results of rumen fluid pH pattern agrees with data of other investigators (Bader. 1993 and El-Ashry *et al.* 1997). Also. Andrews *et al.* (1969) found a highly significant ($P<0.01$) trend for rumen pH to increase as the concentration of dietary crude fiber increased. The same results and trends were observed by El-Ashry *et al.* (1972).

There were also significant ($P<0.01$) differences among sampling times where the highest value was recorded for zero hrs while, the lowest value was recorded after 3 hrs post feeding. The values increased again after 6 hrs. This is in agreement with Cottyn and Boucque (1968). Prasad *et al.* (1972) reported that rumen pH is one of the most important factors affecting the fermentation in the rumen and influences its functions. It varies in a regular manner depending on the nature of the diet and on the time that it is measured after feeding and reflects changes of organic acids quantities in the ingesta. 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. They are also agreed with Tawila (1991) who 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. Also. Salim

(1992) found that maximum ruminal pH value of goats was recorded before feeding (zero time). Moreover, these results agree with Abd El-Aziz *et al.* (1993) and El-Ashry *et al.* (1997).

Our results may be related to 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 (i.e. 6 hrs post feeding). This assumption is in agreement with the conclusion of Roddy and Roddy (1985) who stated that the pH values were inversely related to TVFA concentration In the rumen.

Ruminal TVFA' s values, obtained in this study, were within the normal levels (3.07-19.9 m. eq/dl of rumen liquor) reported by Kandil *et al.* (1996). Total volatile fatty acid values for T2, T3 and T4 were higher ($P<0.01$) than the control (T1) (Table 4). This result indicate that ruminal TVFA' s were significantly higher for goats fed on biologically treated cotton stalks (T2, T3, and T4) than control (T1). It is suggested that increase of fermentation process in biologically treated cotton stalks specially in T4 might resulted in increasing production of VFA s. Moreover, the VFA s were found to correlate significantly and negatively with ruminal pH values (Muller, 1973) which was the case in this study. Concerning the effect of sampling time, the normal TVFA' s concentration (before feeding) was lower ($P<0.01$) in all treatments than post feeding. such values increased ($P<0.01$) to reach higher levels ($P<0.01$) than that at pre feeding (Table 4). The highest TVFA's values observed in the biological treatments at all measured times, suggests that the anaerobic fermentation of biologically treated cotton stalks specially in T4 was more faster and more efficiently produced VFA s than control. Meanwhile, it may be due to the differences among treatments in digestibility of organic matter (Table 2).

It should be noted that, the VFA s concentration in rumen is governed by several factors such as DM digestibility, rate of absorption, rumen pH, transportation of the digesta from the rumen to other parts of the digestive tract and the microbial population in the rumen and their activities (Allam *et al.* 1984). One factor or more of these cases could change its pattern with proceeding time and might affect the total concentration of VFA s found in the rumen media.

Values of rumen liquor nitrogen fraction (ammonia-nitrogen, total nitrogen, NPN and true protein nitrogen) of treatments T2, T3 and T4 were higher ($P<0.01$) than value of the control (Table,4). These results indicated that ruminal ammonia-nitrogen, total nitrogen, NPN and true protein nitrogen were significantly higher for goats fed biologically treated cotton stalk (T2, T3 and T4) than control (T1). It can be noticed that T4 showed the highest values of nitrogen fractions followed by T2 then T3. However, it is well recognized that ammonia-nitrogen found in the rumen at any given time represent the net concentration value of its production, utilization by rumen microbes, absorption across the rumen wall, dilution by other factors and passage to the lower gut, differences in chemical composition of the rations, differences in the source of components of nutrients in the rations and consequently the availability of different components and recycled N via saliva which might have affected rumen microflora. It might be concluded that the increase in ruminal protein digestion (Table, 2) with biologically treated cotton stalks is due to increasing the ruminal ammonia-nitrogen compared

to the untreated cotton stalks based rations.

The higher values observed with the biologically treated based rations especially T4 at all times indicate that the release of ammonia from those rations were easier (Pujszo, 1964) than control rations, or that treated rations were it is well utilized by rumen microbes. Other investigators attributed the increase in ammonia-nitrogen concentrations in the rumen media to reduction of ammonia-nitrogen absorption by rumen epithelium or to a decrease in the efficiency of microbial protein synthesis (Smith *et al.* 1980 and Ikwuegbu and Sutton, 1982).

The effect of sampling time on nitrogen fractions concentration showed that values were at the minimum before feeding and increased to its maximum levels at 3 hrs after feeding. Then values tended to decrease gradually as the time passed up to 6 hrs after feeding. The peak of ruminal ammonia nitrogen at 3 hrs after feeding may be due to deamination of amino acids in the rumen (Chandra *et al.* 1991). Our results are supported by results of Cottyn and Boucque (1968) and El-Ashry *et al.* (1997). They reported that ammonia-nitrogen concentration in the rumen liquor was minimum before feeding, increased to its maximum level 3 hrs post feeding. However, they found that it was nearly the same before feeding. and at 6 hrs after feeding.

It can be noticed that T3 showed the highest value of ruminal total nitrogen followed by T2 and T4. Yadav and Yadav (1988) noticed that increased ruminal total nitrogen concentration might be due to higher intake of nitrogen and higher crude protein digestibility. This finding agrees well with the present results.

Also, it can be noticed that T3 and T4 showed the highest values of ruminal non-protein nitrogen followed by T2 (Table, 4).

It can be noticed that there were no significant differences among the overall mean of ruminal true protein-nitrogen for the biological treatments (T2, T3 and T4).

Blood serum protein fractions:

Values of serum protein fractions (total protein, albumine, globuline and A/G ratio) for treatments T2, T3 and T4 were higher ($P<0.01$) than value of their control (Table 5). It can be noticed that T4 recorded the highest value of serum total protein followed by T2 and T3. There was no differences between the values of serum total protein in T2 and T3. These results were parallel with values of CP content in the experimental ration (Table 1) and the results of OM and CP digestibility (Table 2), which indicated better utilization of dietary protein and ruminal true protein-nitrogen (Table 4) through digestive tract. There were significant differences ($P<0.01$) in serum protein fraction levels among the sampling times. The values were minimum at zero hrs (before feeding) and increased to maximum levels at 3 hrs after feeding. Then the values tended to decrease at 6 hrs after feeding except for A/G ratio, which showed no significant difference between sampling time.

Table 5. Effect of biological treatments of roughage on some serum parameters at different sampling times.

Treatments	Parameters							
	T. protein (g/dl)	Albu. (g/dl)	Globulin (g/dl)	A/G Ratio	Urea-N (mg/dl)	Creat. (mg/dl)	GOT (U/l)	GPT (U/l)
T1	6.65^{c}	3.47^{b}	3.18^{b}	1.09^{b}	23.42^{d}	1.06^{c}	39.42^{c}	22.66^{d}
T2	6.80^{b}	3.65^{a}	3.15^{b}	1.16^{a}	25.99^{c}	1.15^{b}	42.59^{b}	24.41^{c}
T3	6.84^{b}	3.67^{a}	3.17^{b}	1.16^{a}	27.33^{b}	1.23^{a}	43.05^{ab}	25.17^{b}
T4	6.93^{a}	3.64^{a}	3.29^{a}	1.10^{b}	28.61^{a}	1.25^{a}	43.66^{a}	25.68^{a}
Sampling time								
Zero hrs	6.71^{b}	3.53^{b}	3.18^{b}	1.11^{a}	24.74^{c}	1.10^{c}	40.76^{c}	23.67^{b}
3 hrs	6.80^{a}	3.60^{a}	3.21^{a}	1.12^{a}	28.79^{a}	1.19^{a}	43.20^{a}	25.23^{a}
6 hrs	6.73^{b}	3.56^{ab}	3.17^{b}	1.12^{a}	25.58^{b}	1.13^{b}	41.86^{b}	23.82^{b}

The present estimates lie within the normal range of total protein (6-8 g/dl) reported by Recce (1991) and close to the value (6.9 g/dl) reported by Smith *et al.* (1979).

Kumar *et al.* (1980) reported that there was a positive correlation between dietary protein and plasma protein concentration. It is of interest to indicate that ruminal true protein and serum total protein had the same trend during the experiment.

Values of serum albumin of treatments T2, T3 and T4 were higher ($P<0.01$) than value of their control (Table, 5). It can be noticed that there was no significant differences among biological treatments (T2, T3 and T4). This result may be due to the higher ($P<0.01$) digestibility of crude protein (Table 2) and nitrogen balance (Table 3) for all biological treatments (T2, T3 and T4) than control (T1). Rowlands (1980) reported that dietary protein could affect the concentration of serum albumin.

Data indicated the healthy status of the liver since, the liver is the main organ of albumin synthesis. Values of albumin were within the range obtained by Cornelius (1970) (3.5 to 5.0 g/dl). The persent results agree with the results obtained by Bader (1993) and El-Ashry *et al.* (1997).

The values of serum globulin ranged from 3.12 in T2 to 3.15 (g/dl) in T4 (Table, 5). The present values of serum globulin concentration were within the normal values.

The values of serum A/G ratio ranged from 1.09 to 1.16. Values of serum A/G ratio for treatments T2 and T3 were higher ($P<0.01$) than value of their control (Table 5). It can be noticed that T2 and T3 recorded the highest values for serum A/G ratio followed by T4.

It is important to note that all values of A/G ratio were higher than 1.0, which indicate that animals did not suffer from any health problems that might affect the performance of the experimental animals.

Our results are in a good agreement with Maxine (1984) who reported that albumin tends to predominate over globulin in sheep and goats. Also agree with Bader (1993) and El-Ashry *et al.* (1997).

Values of serum urea-nitrogen concentration for biologically treated diets (T2, T3 and T4) were higher ($P<0.01$) than value of their control (Table, 5). This result may be supported by the finding cited early, that rumen ammonia-nitrogen concentrations were higher ($P<0.01$) in the biologically treated diets as compared with control (Table 4).

Normal levels of serum urea-nitrogen in goats range from 8 to 40 mg/dl (Rokha, 1985).

Results of serum urea-nitrogen concentration indicated that feeding goats on biologically treated cotton stalks had no adverse effect on kidney function. Results are close to those obtained by Cross *et al.* (1978), Bader (1993) and El-Ashry *et al.* (1997). According to Lewis *et al.* (1957) the overall patterns of rumen ammonia-nitrogen concentration are roughly parallel, and the measurement of blood urea was proposed as supplementary test for the efficiency of nitrogen utilization in ruminants. The apparently normal values obtained in the present study for blood serum urea-nitrogen and fluid ammonia suggests efficient utilization of nitrogen in the different experimental rations by rumen microorganisms.

Serum creatinine concentration (mg/dl):

The values of serum creatinine concentration ranged from 1.06 in T1 to 1.25 (mg/dl) in T4. Values of serum creatinine for biological treatments (T2, T3 and T4) were higher ($P<0.01$) than value for their control (Table 5), where Thus T3 and T4 were higher ($P<0.01$) than T2. The normal plasma creatinine level ranged between 0.08 to 1.4 mg/dl (Owen *et al.* 1954). In addition, Blanch and Setchall (1960) found that plasma creatinine levels ranged between 0.9 and 1.2 mg/dl in fasting sheep. Values of the present study were similar to those obtained by Kaneko (1989) who reported that serum creatinine ranged between 1.2 to 1.9 mg/dl serum in sheep blood.

Regarding the effect of sampling time on serum urea and creatinine concentrations. There were significant ($P<0.01$) differences among the sampling times. The values were minimum at zero hrs (before feeding) and increased to maximum levels at 3 hrs after feeding. Then the values tended to decrease at 6 hrs after feeding (Table, 5).

Values of the present study are also similar to those obtained by Omer (1994) who reported that all the experimental treatments showed higher ($P<0.05$) values of serum creatinine at 4 hrs post feeding than those at zero hrs.

Generally, serum creatinine level is a useful indicator of glomerular filtration in the kidney. The normal serum creatinine level for goats ranged from 1.0 to 1.8 mg/dl as reported by Kandil *et al.* (1996).

Serum transaminases:

There were significant ($P<0.01$) differences among the overall means of serum GOT and GPT concentration for different treatments. The values of serum GOT ranged from 39.42 in T1 to 43.66 units/ml in T4. Values of serum GOT and GPT concentrations of biologically treated diets (T2, T3 and T4) were higher ($P<0.01$) than value for their control (Table, 5). However, T4 was higher than T2.

Regarding the effect of sampling times on serum GOT and GPT concentrations, there were significant ($P<0.01$) differences among the sampling times. The values were minimum at zero hrs (before feeding) and increased to its maximum levels at 3 hrs after feeding. Then the values tended to decrease again at 6 hrs after feeding (Table, 5).

Several factors affect GOT and GPT enzymes; as activities as feeding practices, environment, genetic control, response to stress, age, liver function and body weight (Boots *et al.* 1969). It is clear that the e - perimental treatments did not affect significantly serum GOT and GPT levels in the experimental goats.

It could be noticed that GOT levels were higher than those for GPT for all experimental treatments. On the contrary, Abd El-Kareem (1990) and El-Ashry *et al.* (1997) found that GPT levels were higher than GOT levels. In general, the

values recorded for GOT and GPT were within the normal range reported by Abd El-Kareem (1990) who found that values of GOT and GPT ranged from 24 to 65 and from 19 to 37 unit/ml, respectively in goats.

CONCLUSION

Mixture of *Trichoderma viride* fungus and *Saccharomyces cerevicia* could be used successfully to enrich poor quality roughages such as cotton stalks with protein and improve nutrients digestibility and nutritive value of rations containing biologically treated crop-residues without any adverse effects on animal performance and health.

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تأثير المعاملات الكميائية والبيولوجية لبعض مخلفات الحقل على قيمتها الغذائية. ٣- معامل الهضم الظاهرى وبعض مقاييس سائل الكرش وسيرم دم المعز

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تم اجراء ٤ تجارب هضم وميزان ازوت على المعز البلدى التى تتناول علائق تتكون من ٢٥% حطب قطن معامل بيولوجيا (بالفطر *Trichoderma viride* او بالخميرة *Saccharomyces cerevisiae* او بمخلوط الفطر والخميرة) و٢٥% تبن قمح و٥٠% علف مركز وقد تم دراسة بعض قياسات سائل الكرش وسيرم الدم.

دلت نتائج تلك الدراسة على انه يمكن استخدام المعاملات البيولوجية وخاصة المعاملة بمخلوط الفطر والخميرة فى علائق المعز بنجاح ودون ظهور اى تأثير غير مرغوب على نشاط الكرش او وظائف الكبد والكليه وكان اداء الحيوانات جيداً.