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EFFECT OF BIOLOGICAL TREATMENTS ON THE NUTRITIVE VALUE OF RICE STRAW

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SUMMARY

The objective of this study was to the effect of biological treatments (ZAD, fungus and ZAD with fungus) on feed intake, digestibility coefficients, nutritive value and nitrogen balance of rice straw and some rumen liquor and blood parameters.

Twelve adult Ossami rams were divided into four similar groups and used to carried out four metabolic trials using three animals for each group (all groups were fed the rice straw *ad. Libitum*) the first (T1) was the control (untreated rice straw), the second (T2) was rice straw treated with ZAD, the third (T3) was rice straw treated with fungus (*Pleurotus osteratus*) and the fourth (T4) was rice straw treated with ZAD and fungus. T2, T3 and T4 increased ($P<0.05$) crude protein of rice straw and decreased ($P<0.05$) dry matter, crude fiber, NFE, NDF, ADF, ADL and cellulose contents than the control group. Dry matter intake (DMI) increased ($P<0.05$) in the groups fed rice straw treated with ZAD, fungus and ZAD+ fungus than the control group. ZAD, fungus and ZAD + fungus treatments increased ($P<0.05$) digestibility coefficients of CF, ADF, NDF, ADL, cellulose and hemicellulose than the untreated rice straw. Total digestible nutrients (TDN) and digestibility of crude protein (DCP) for T2, T3 and T4 were higher ($P<0.05$) than untreated rice straw. The rumen liquor parameters (NH_3-N) and TVFA's concentrations were highest value after 3 hours of feeding in all groups. All of treated rice straw groups had no significant differences ($P<0.05$) for urea, total protein, albumin, globulin, GOT and GPT than untreated rice straw.

Twenty-four Ossimi lambs averages (20.0 ± 0.3 kg) were used in feeding trial lasted 120 days. Feeding trail results showed all biological treatments had higher dry matter intake (1037, 990, 896 and 786g/d) and average daily gain (169.2, 163.3, 134.3 and 92.5g) for T2, T3, T4 and T1, respectively. Biological treatments indicated that it they could be good method to improve the nutritive value of rice straw.

***Keywords**: rice straw, fungus, biological treatments, feeding value, sheep.*

INTRODUCTION

Large quantities of agricultural residues with low feed value exist through the world. At present most of these materials are not only a wasting natural resource but also an important sources of environmental pollution.

In Egypt, the agricultural crops generate plentiful and inexpensive by-products available around the year but

are not efficiently used (22 million tons of plant by-products produced annually (Agriculture Economic and Statistics Institute, 1999).

Residues are burned or wasted, and hence lead to environmental pollution and consequently health hazards. The primary factors limiting the utilization of crop residues are low digestibility, low protein content and low platability. Thus, to increase digestibility of crop residues, 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 from non-lignified one. There have been attempts to do that by mechanical, chemical or biological treatments (Baker *et al.*, 1975 and Jackson, 1978).

Biological treatments of some agricultural by-products become essential in order to degrade ligno-cellulosics into lignin, cellulose, hemicellulose and improve crude protein content. It is well known that some micro-organisms, including celluloses enzymes from anaerobic bacteria and white rot fungi (*Pleurotus ostreatus)* can degrade lignin in the cell walls and attempts have been made to improve digestibility of plant residues (Abdel-Aziz and Ismail, 2001).

This study aimed to investigate, the ability of biological treatments to improve nutritive value as total digestible nutrient (TDN) and digestibility crude protein (DCP) of rice straw as crop residues and the effect of biological treatments of rice straw on chemical composition, nutrient digestibility, nitrogen metabolism, ruminal and blood parameters of sheep fed the experimental rations.

MATERIALS AND METHODS

Microorganisms:

1- ZAD treatment:

ZAD (Patent on: 22155) is bio-tech product made from natural sources to elevate the level of celluloses enzymes from anaerobic bacteria. It is produced in the Molecular Biology Lab., Animal Production Department, Ain Shams University according to the procedure of (Gado, 1997)

2- Fungal treatment:

Pleurotus ostreatus NRRL 3780 was obtained from the National Center of Agricultural Utilization Research, Agricultural Research Service, US, Department of Agriculture, Peoria, USA.

Media used

This fungus was maintained on Czapek's medium (Difco, 1984) or molasses medium and grown at 25-28°C for 5 days.

Substrate preparation and cultivation:

Rice straw was chopped into 3-5 cm. It was boiled for 2 hours and strained until moisture level was to 65-70%. The wet rice straw (100kg) was put in plastic bags and inoculated with ZAD (1 litter/500kg rice straw) and/or fungus (1 litter/100kg rice straw), layer by layer in order. Then the plastic bags were plugged and a moderate temperature (28-30 °C).

Analytical methods:

Chemical composition of feed, feces and urine were determined according to A.O.A.C (1990) method. Neutral detergent fiber (NDF), acid detergent fiber (ADF) and acid detergent lignin

(ADL) were determined by the methods of Van Soest (1982).

In vitro rate of degradation of dry matter

In vitro extent (48 hrs.) was used to determine the rate of degradation of dry matter per hour. The natural log method was used to convert data to linearity (Mertens, 1977). The apparent *in vitro* digestibility of the rice straw was also determined through three periods (30, 45 and 60 days of ensilling) according to Tilley and Terry (1963).

Two tubes as a replicate of each sample were used in incubation times (0, 2, 4, 6, 8, 24 and 48 hours). Two blank tubes were prepared for each incubating time. Rumen liquor was collected by stomach tube from the rumen of three mature Ossami sheep, which were fed only berseem hay as a basal diet. Fluids from different sheep were mixed together to have one representative sample of rumen fluid. Fluid was squeezed through 4 layers of cheesecloths, placed in prewarmed thermos and flushed with CO_2.

Digestibility trial

Twelve adult Ossimi rams were divided into four similar groups and used to carry out four metabolic trials using three animals for each group as follows:

T1: Untreated rice straw (control). **T2:** Rice straw with ZAD (1 litter/500kg rice straw).**T3:** Rice straw with (*Pleurotus osteratus*) (1 litter/100kg rice straw). **T4:** Rice straw with ZAD + (*Pleurotus osteratus*).

Preliminary period lasted 21 days followed by 7 days for collection period. The nutrient intake and excretion were determined to calculate their digestibility and utilization by conventional balance trial method. The experimental animals were fed concentrate feed mixture (CFM) to cover their maintenance requirement (NRC, 1985). CFM consists of 40% undecorticated cotton seed meal, 17% yellow corn, 20% wheat bran, 5% molasses, 15% soybean meal, 2% limestone and 1% salt. All groups were fed the rice straw *ad. libtum*. Feces were collected quantitatively every day during the collection period sprayed with 10% H_2SO_4. At the end of the collection period, fecal samples from each ram were ground mixed well and kept in the refrigerator for chemical analysis. Samples of feed, feces and urine were analyzed according to A.O.A.C. (1990).

Rumen liquor samples were taken from each animals at the end of collection period at 0, 3 and 6 hours after morning feeding by stomach tube. Ruminal pH and ammonia nitrogen (NH_3-N) were immediately determined by Conway (1963). Frozen rumen liquor samples were analyzed for total volatile fatty acids (TVFA's) by steam distillation according to Abou-Akkada and Osman (1967).

Blood samples were taken from each animal at the end of the collection period of each trial before morning meal. Blood samples were collected in vactioner tubes and left at room temperature for 2hrs, centrifuged at 3500 r.p.m. for 15 minutes to obtain serum, which was stored at –20°C till analysis. Blood serum was analyzed using special kits for urea (Henery, 1974), total protein (Cannon, 1974), Albumin (Doumas *et al.*, 1975) and GOT and GPT (Reitman and Frankel, 1957).

Feeding trial

Twenty-four Ossami lambs aged (7 months) were taken from the station herd and were divided into four similar groups, according to weight. Average initial live body weight was 20.0± 0.2 kg/head and animal groups were fed the four respective rations in 2 meals/day for 120 days. All lambs in the trial were given maintenance requirements according to (NRC, 1985) recommendation and rice straw either treated or untreated were fed *ad .libitum*.

Statistical analysis

The data were statistically analyzed according to Sendecor and Cochran (1980) using SAS (1985). The difference between means was tested by Duncan's multiple range test (1955). One-way analysis of variance as the mathematical model:

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

where: Y_{ijk}= Represents observations. μ= Overall mean. T_i =Treatments. e_{ijk} = experimental error.

RESULTS AND DISCUSSION

The use of molasses as carbon source for fungal growth

In Egypt, one of the most important raw materials produced from the sugar industry is the sugar cane molasses. It was found valuable to study the use of Egyptian sugar cane molasses in fungal growth.

Table (1) shows that increasing the concentration of molasses from 5 to 10% resulted in increasing ($P<0.05$) the growth of *Pleurotus ostreatus*. At 10% molasses concentration the mycelial fresh weight reached its maximum being 15.06 gl^{-1}. A decrease in mycelial fresh weight was noticed at 20 and 30% molasses concentration being 4.39 and 3.73 gl^{-1}. So, the addition of 10% molasses concentration to rice straw was used in the following treatments.

Chemical composition of rice straw and experimental rations

Chemical composition of experimental rice straw are presented in Table (2) revealed that rice straw treated with ZAD (T1), rice straw treated with fungus (T2) and rice straw treated with ZAD and fungus (T3) resulted in decreasing ($P<0.05$) dry matter (DM) being 90.51, 88.15 and 90.02%, respectively. Substantial increase ($P<0.05$) in crude protein (CP) of the fungal treated rice straw against other treatments was found being 9.78, 6.08, 8.07 and 3.41% for ZAD, fungus, ZAD treated with fungus and control, respectively. Similar trend was observed by (Gupta and Singh, 1991).

Abdel–Aziz and Ismail (2001) found that NDF, ADF and cellulose contents of fungus treated rice straw decreased by 77.67, 48.81 and 39.73%, respectively.

The degradation of various fiber fractions decreased during the ensilage period with the decreasing level of hemicellulose. It was noticed that, the effect of treatment of ZAD, fungus and ZAD with fungus were greater on NDF, ADF, ADL, cellulose and hemicellulose indicating the greater influence on hemicellulose breakdown as effect of the treatment. These results were in agreement with Gado, (1997); Mahrous, and Abou Ammou (2005) and Bassuny *et al.*, (2003c).

In vitro degradation of dry matter

Table (1): Effect of different concentration of molasses on fungal fresh weight.

Molasses concentration %	Fungal fresh weight gl^{-1}	±SE
5 (control)	6.55^{b}	0.38
10	15.06^{a}	0.41
20	4.39^{c}	0.26
30	3.73^{d}	0.11

a,b,c and d Means with different superscripts in the same row differ significantly (P<0.05).

Table (2): Chemical composition (% on DM basis) of untreated, treated rice straw and concentrate feed mixture.

Item	T1	T2	T3	T4	CFM
DM	91.13	90.51	88.15	90.02	88.80
OM	85.55	82.01	83.65	82.19	87.34
CP	3.41	6.08	9.78	8.07	16.20
CF	38.33	31.08	33.35	35.04	13.04
EE	1.20	1.78	1.57	1.37	3.24
NFE	42.61	43.07	38.95	38.44	54.86
Ash	14.45	17.99	16.35	17.08	12.66
NDF	77.09	73.18	74.29	75.02	32.75
ADF	45.28	43.13	43.21	44.54	10.46
ADL	9.89	9.01	9.32	9.62	3.48
Cellulose	35.39	34.12	33.89	34.92	6.98
Hemicellulose	31.81	30.05	31.08	30.48	22.29

T1: Untreated rice straw (control), T2: Rice straw + ZAD, T3: Rice straw + fungus, T4: Rice straw + ZAD + fungus, CFM: Concentrate feed mixture

Table 3: *In vitro* rate of degradation of dry matter (extent 48 hrs.).

Ensiling Periods (days)	T1	T2	T3	T4	±SE
30	0.0234^{d}	0.0278^{a}	0.0252^{b}	0.0242^{c}	0.003
45	0.0223^{d}	0.0276^{a}	0.0248^{b}	0.0236^{c}	0.002
60	0.0212^{d}	0.0271^{a}	0.0240^{b}	0.0227^{c}	0.003

a, b ,c and d Means with different superscripts in the same row differ significantly (P<0.05).

T1: Untreated rice straw (control). T2: Rice straw + ZAD.

T3: Rice straw + fungus. T4: Rice straw + ZAD + fungus.

Results in Table (3) showed an increase ($P<0.05$) in the *in vitro* rate of degradation in treated rice straw in comparison with the control treatment. Also, the biological treatments has the effects; to predigest the cellulose and to release carbohydrates for fermentation. Biological treatments of roughages reduced log time (Adebowale and Nakashima, 1992 and Gado, 1999). Chalupa and Lee (1966) reported from *in vitro* cellulose digestion studies, that log time was evident at 6, 12 and 18 hrs. Whereas incubation after 24 hrs. represented the extent of digestion. The 18 hrs. value was used as index of *in vitro* cellulose digestion and the 30 hrs. value as a measure of total cellulose digestion. In general, the best improvement in *in vitro* rate of degradation was found with ZAD followed by fungus and ZAD with fungus under different incubation periods than that control. These results were in agreement with Bassuny *et al.*, (2005)

Digestibility coefficients and nutritive value

Nutrient digestibility coefficients and nutritive value have been affected by biological treatments and presented in Table (4). The DM digestibility of sheep fed rations containing treated rice straw was significantly higher ($P<0.05$) than those of untreated rice straw. This result might be due to the better palatability of treated rice straw than untreated and better utilization by the host animal.

Rice straw treated with fungus had the highest value of crude protein digestibility being 69.5% as shown in Table (4). Digestibility coefficient of CF was significantly ($P<0.05$) higher for rice straw treated with ZAD being 63.7% and the lowest digestibility coefficient was recorded for the control group (45.0%). The improvement in DM, several authors (Gado, 1997; Fouad et al., 1998 and Deraz and Ismail, 2001; Mahrous and Abou Ammou, 2005; Bassuny *et al.* 2003c and Bassuny *et al.*, 2005) observed CP and CF digestibility coefficients over a wide range of low quality roughages by ZAD and fungus treatments.

Digestibility of NDF for both ZAD and fungus treatments was significantly higher ($P<0.05$) than those of ZAD with fungus and the control group. The ADF digestibility of both ZAD and fungus treatments were significantly higher ($P<0.05$) than the control treatment. Cellulose digestibility coefficient of rice straw treated by ZAD (64.91%) and fungus (57.32%) was higher than ZAD with fungus (50.39%) which increased significantly ($P<0.05$) than the control group (47.73%). Hemicellulose digestibility was also the highest value (78.53%) for ZAD treatment followed by fungus (71.55%) and ZAD with fungus (63.81%) and the lowest value was recorded for the control treatment (60.60%). Gado (1997), Fouad et al., (1998); Deraz and Ismail (2001) reported similar results and Abdel-Aziz and Ismail (2001); Bassuny *et al.*, (2003b) and Bassuny *et al.*, who reported that the ZAD and fungus treatments had the effect of loosening lignucelluloletic bonds and solublize some of the hemicellulose content.

The nutritive value of treatments calculated as TDN were the highest value (61.9%) by ZAD treatment followed by fungus treatment (59.4%) and both were significantly higher value ($P<0.05$) than the control. Also, DCP

Table (4): Effect of biological treatments on digestibility and nutritive value by experimental animals.

Item	T1	T2	T3	T4	±SE
Digestibility:					
DM	54.66^{b}	68.47^{a}	63.71^{a}	55.39^{b}	1.38
OM	56.74^{d}	70.12^{a}	68.68^{b}	65.41^{c}	0.08
CP	44.74^{c}	50.27^{b}	69.48^{a}	54.29^{b}	0.47
CF	45.04^{c}	63.74^{a}	60.71^{a}	52.63^{b}	0.96
EE	62.31^{c}	72.71^{a}	67.32^{b}	65.51^{b}	0.43
NFE	60.31^{c}	74.48^{a}	72.36^{a}	67.21^{b}	1.51
NDF	48.68^{d}	72.97^{a}	58.16^{b}	52.47^{c}	1.13
ADF	39.04^{d}	65.49^{a}	54.18^{b}	46.44^{c}	0.27
ADL	27.42^{c}	47.91^{a}	33.73^{b}	31.07^{b}	0.78
Cellulose	47.73^{d}	64.91^{a}	57.32^{b}	50.39^{c}	0.26
Hemicellulose	60.60^{d}	78.53^{a}	71.55^{b}	63.81^{c}	1.20
Nutritive value %:					
TDN	50.50^{d}	61.89^{a}	59.40^{b}	55.81^{c}	0.62
DCP	4.32^{d}	6.24^{c}	9.39^{a}	7.40^{b}	1.23

a, b ,c and d Means with different superscripts in the same row differ significantly (P<0.05).

T1: Untreated rice straw (control). T2: Rice straw + ZAD.

T3: Rice straw + fungus. T4: Rice straw + ZAD + fungus.

Table (5): Effect of biological treatments on nitrogen balance by experimental animals.

Item	T1	T2	T3	T4	±SE
Nitrogen Intake (NI) (g/h/d)	14.13^{d}	17.76^{c}	22.99^{a}	20.09^{b}	0.08
Urinary Nitrogen (UN) (g/h/d)	8.57^{d}	8.73^{c}	9.56^{b}	10.05^{a}	0.63
Feces Nitrogen (FN) (g/h/d)	4.54^{b}	3.67^{c}	5.43^{a}	3.48^{d}	0.65
Digested Nitrogen (DN) (g/h/d)	9.58^{d}	14.09^{c}	17.55^{a}	16.61^{b}	0.14
Nitrogen Balance (NB) (g/h/d)	+1.01^{d}	+5.36^{c}	+7.75^{a}	+6.56^{b}	0.29
NB/NI	7.16^{c}	30.18^{c}	33.69^{a}	32.62^{a}	0.07
NB/ND	10.56^{d}	38.05^{b}	44.12^{a}	39.47^{b}	1.17

a, b ,c and d Means with different superscripts in the same row differ significantly (P<0.05).

T1: Untreated rice straw (control). T2: Rice straw + ZAD.

T3: Rice straw + fungus. T4: Rice straw + ZAD + fungus.

was the highest for fungus treatment and for ZAD with fungus treatment and both were significantly higher ($P<0.05$) than the control.

Nitrogen Balance (NB)

Nitrogen balance calculation is shown in Table (5). Nitrogen intake (g/h/d) was clearly superior for all animals fed the biological treatment than the control. Therefore, digested N for fungus and ZAD with fungus treatments were significantly higher ($P<0.05$) than the control treatment. Results also, showed that the NB (g/h/d) for fungus, ZAD with fungus and ZAD treatment were significantly higher ($P<0.05$) than the control. These results are in agreement with those obtained by Abdel-Aziz and Ismail (2001); Fouad *et al.*, (1998); Deraz and Ismail (2001) and Bassuny *et al.*, 2005).

Rumen liquor and blood parameters

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

Rice straw treated with fungus maintained the highest value of ruminal TVFA's after 3 hr. of feeding followed by ZAD treatment, ZAD with fungus and the lowest values recorded for the control group. These results agree with those obtained by Henics (1987) who found that the level of ruminal TVFA's reached its maximum at 3 hr. after feeding for lambs fed *ad. libitum*. These results of biological treatments which might be related to the more utilization of the dietary energy and positive fermentation in the rumen. On the contrary, the lowest pH values were recorded after 3hr. of feeding for the different treatments.

The values of blood serum urea, total protein, albumin, globulin, albumin/globulin ratio, GOT and GPT for the animals fed rice straw treated with ZAD, fungus, ZAD with fungus and untreated are presented in Table (6). Treatments 2, 3 and 4 which were fed ration contained biological treatments rice straw resulted in decreasing non significantly blood serum urea concentration than the animal fed the untreated rice straw (T1). The blood serum total protein and its fractionations were within the normal values. The range of GOT was 20.36 to 20.52 U/L and for GPT was 33.59 to 33.71 U/L, which are within those normal ranges. These results of blood metabolism are in agreement with those reported by Fouad *et al.*, (1998) and Deraz and Ismail (2001); Bassuny *et al.*, (2003b) and Bassuny *et al.*, (2005).

Feeding trial

The average DM intake expressed as (g/h/d), average daily body gain and feed conversion of the experimental groups are presented in Table (7). The result revealed that the DMI as (g/h/d) of lambs during 120 days of the experimental period was higher for lambs fed ZAD treatment (1037g/h/d) followed by fungus treatment (990 g/h/d) and ZAD with fungus (896 g/h/d) than the control (786 g/h/d). The results

Table (6): Effect of biological treatments on rumen liquor and blood parameters by experimental animals.

Item	Time	T1	T2	T3	T4	± SE
Rumen parameters:						
pH	0	5.56^{c}	6.31^{b}	6.85^{a}	5.52^{c}	0.64
	3	5.17^{c}	5.81^{b}	6.56^{a}	5.10^{c}	0.60
	6	5.46^{c}	6.46^{b}	6.97^{a}	5.49^{c}	0.80
NH_3-N (mg/100ml)	0	11.86^{a}	10.86^{b}	10.91^{b}	10.85^{b}	0.02
	3	17.89^{d}	20.64^{c}	25.83^{a}	22.04^{b}	0.03
	6	13.28^{d}	17.62^{c}	20.44^{a}	19.76^{b}	0.02
TVFA's (meq./100ml)	0	9.54^{d}	10.36^{a}	10.11^{b}	10.02^{c}	0.52
	3	12.52^{d}	13.54^{b}	14.44^{a}	13.04^{c}	0.82
	6	9.25^{d}	9.77^{a}	9.64^{b}	9.44^{c}	0.13
Blood parameters:						
Urea (mg/100ml)		25.20	14.85	24.79	24.90	NS
Total protein (gm/100ml)		7.32	7.40	7.35	7.45	NS
Albumin (gm/100ml)		3.90	3.84	3.78	3.80	NS
Globulin (gm/100ml)		3.60	3.56	3.57	3.65	NS
A/G ratio		1.08	1.07	1.05	1.04	NS
GOT (U/L)		20.46	20.52	20.40	20.36	NS
GPT (U/L)		33.67	33.71	33.59	33.62	NS

a, b ,c and d Means with different superscripts in the same row differ significantly ($P<0.05$), T1: Untreated rice straw (control), T2: Rice straw + ZAD, T3: Rice straw + fungus, T4: Rice straw + ZAD + fungus.

Table (7): Effect of biological treatments on feed intake and feed conversion of experimental animals (n = 6 Exp. period 120 days).

Item	T1	T2	T3	T4
Initial weight (kg)	20.1	20.2	20.3	20.2
Final weight (kg)	31.2	40.5	39.9	36.3
Total gain (kg)	11.1	20.3	19.6	16.1
Average daily gain (ADG) (g)	92.5	169.1	163.3	134.3
DMI (g/d)	786	1037	990	896
DMI($g/W^{0.75}$)	69.0	80.2	77.0	73.1
Concentrate feed mixture	406	406	406	406
Concentrate feed mixture ($g/W^{0.75}$)	35.6	31.3	31.6	33.1
Concentrate feed mixture %	51.6	39.1	41.0	45.3
Roughages	380	631	584	490
Roughages ($g/W^{0.75}$)	33.4	48.8	45.4	40.0
Roughages %	48.4	60.9	59.0	54.6
Feed conversion	8.5	6.1	6.0	6.6

T1: Untreated rice straw (control). T2: Rice straw + ZAD.
T3: Rice straw + fungus. T4: Rice straw + ZAD + fungus.

of feed conversion (g DM/g gain) showed that the fungus treatment recorded the best value followed by the ZAD treatment and ZAD with fungus treatment than the control. These results were in agreement with Mahrous and Abou Ammou (2005) and Bassuny *et al.*, (2003b) and Bassuny *et al.*, (2005). Mohamed *et al.* (1998) indicated that the feed conversion of treated rice straw was better compared with untreated rice straw.

It could be concluded that the biological treatments of rice straw by ZAD, fungus and ZAD with fungus increased protein content, protein digestibility and fiber fractions digestibility. The recycling of agricultural wastes is important to raise its nutritional value and can be used in the ruminants feeding. Biological treatments can utilize lignin along with cellulose and other components of the substrate, these organisms grow slowly and degrade the structural carbohydrates of crop residues. In addition, biological treatments as a result of molecular biology are preferable in terms of being a biological treatment, rather than the other treatments such as chemical and physical treatments for better and clear environment.

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تأثير المعاملات البيولوجية على القيمة الغذائية لقش الأرز

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أجريت هذه التجربة لدراسة تأثير المعاملات البيولوجية (المعاملة بمركب زاد ، فطر (*Pleurotus osteratus*) وخليط بينهما على قش الأرز ودراسة كمية الغذاء المأكول ومعاملات الهضم والقيمة الغذائية وميزان الأزوت وبعض مكونات الدم وسائل الكرش ومعدلات النمو والكفاءة الغذائية للأغنام.

أستخدم عدد ١٢ كبش اوسيمى لتجربة الهضم وقسمت الى ٤ مجاميع متساوية هى:

المجموعة الأولى: كنترول (قش أرز غير معامل) وتسمى مجموعة المقارنة.
المجموعة الثانية: قش أرز معامل بمركب زاد.
المجموعة الثالثة: قش أرز معامل بفطر (*Pleurotus osteratus*).
المجموعة الرابعة: قش أرز معامل بخليط من مركب زاد والفطر.

واستمرت تجربة الهضم لمدة ٤ أسابيع (٣ أسابيع فترة تمهيدية + أسبوع فترة جمع المأكول والروث والبول) وفى نهاية تجربة الهضم تم تجميع عينات من سائل الكرش والدم. بينما استمرت تجربة التغذية والنمو لمدة ١٢٠ يوم وذلك باستخدام ٢٤ حمل بمتوسط وزن ٢٠ كيلو جرام قسمت الى ٤ مجاميع متساوية العدد.

وأظهرت النتائج ما يلى:

- أدت المعاملة بكل من الفطر ومركب زاد والخليط بينهما إلى زيادة معاملات الهضم لقش الأرز من المادة الجافة والمادة العضوية والألياف الخام والبروتين و NDF, ADF والسليلوز والهيميسليلوز واللجنين معنويا عند مستوى (٥%) فى المجموعات الثانية والثالثة والرابعة مقارنة بمجموعة المقارنة.
- كان المجموع الكلى للمواد الغذائية المهضومة لمعاملة الفطر ومركب زاد والخليط بينهما اعلى معنويا عند مستوى (٥%) عن مجموعة المقارنة وقش الأرز المعامل بالخليط. وكذلك فى محتوى البروتين المهضوم فكانت أعلاهم المجموعة المعاملة بالفطر ثم المعاملة بالخليط ثم بمركب الزاد ثم مجموعة المقارنة.
- بالنسبة لقياسات الكرش كان تركيز الامونيا - نيتروجين فى سائل الكرش للكباش المغذاة على قش الأرز المعامل اعلى معنويا على مستوى (٥%) مقارنة بالمغذاة على قش الأرز الغير معامل وكذلك مستوى الأحماض الدهنية الطيارة.
- بالنسبة لقياسات الدم كانت المعدلات طبيعية فى كل المجاميع.
- كانت الزيادة فى معدلات النمو وكمية المأكول اليومى فى المجاميع المعاملة بيولوجيا اعلى من المجموعة الغير معاملة (المقارنة).

مما سبق يتضح التأثير الإيجابى للمعاملات البيولوجية الناتجة من البيولوجيا الجزئية على رفع القيمة الغذائية لقش الأرز واستفادة الأغنام من بروتين الغذاء كذلك فأن المعاملات البيولوجية لها القدرة على تكسير المواد اللجنوسليولوزية مثل السليلوز والهيميسليلوز واللجنين وكذلك فان هذه المعاملات تكون غير ملوثة للبيئة.