Zagazig Journal of Agricultural Research

www.zu.edu.eg/agr/journals

EFFECT OF BIOLOGICAL AND CHEMICAL TREATMENTS OF RICE STRAW ON LAMB PERFORMANCE

Ismail M. Abd El-Razik, G.A. Abd-Elrahman* and M.S. Ayyat

Department of Animal Production, Faculty of Agriculture, Zagazig University

ABSTRACT

The present study was conducted out at the department of Animal Production, Faculty of Agriculture, Zagazig University, Zagazig, Egypt. The practical work was carried out at sheep farm belongs to Animal Nutrition Research unit, Radiobiology Applications Department, Nuclear Research Center, Atomic energy Authority, Abu Zabeel, Qaluobia Governorate from August to November 2009, to investigate the effect of chemical and biological treatment of rice straw on performance of male lambs, nutrient digestibility and some blood chemical constituents. Twenty-eight Barki male lambs with average initial live body weight (LBW) of 31.75 kg and about five month of age were divided into four similar groups in live body weight and age (eight animals each). The first group (T1) was fed basal diets which composed of concentrate feed mixture (CFM) and untreated rice straw (RS), while the second group (T2) was fed basal diets which composed of concentrate feed mixture (CFM) and berseem hay (BH). The animals of the third and fourth groups (T3 and T4) were fed on the concentrate of first group (T1) plus either chemical treated rice straw (CTR) or biological treated rice straw (BTR), respectively. All digestibility coefficients as percentages of nutrients showed higher ($P<0.05$, 0.01 or 0.001) values with rations contained Berssem hay and chemical and biological treated rice straw as compared with untreated groups. The improvement in CP digestibility coefficients percentages were 46.88, 38.64 and 41.50%, respectively for Berssem hay, chemical or biological treated rice straw when compared with the control group, also the corresponding values of CF percentages were 18.33, 24.46 and 33.02%, respectively. The corresponding values of EE percentages were 8.97, 22.40 and 6.25%, respectively. The improvement in NFE digestibility coefficients percentages were 14.44, 14.30 and 10.14%, respectively for Berssem hay, chemical or biological treated rice straw when compared with the control group. The nutritive value of treated rations as TDN were the highest for lambs group fed diets containing Berssem hay and chemical or biological treated rice straw with 16.17, 15.99 and 14.17%, respectively when compared with the control group. The corresponding values of DCP percentages were 29.22, 25.60 and 30.03%, respectively. Final live body weight and gain significantly ($P<0.01$ or 0.001) affected with the treatments. Average daily gain at the whole experimental period of lambs in T2 group, T3 group and T4 recorded higher live body weight with 43.44., 43.44 and 14.75%, respectively higher than the control group (T1). Also, feed conversion improved with the feeding treatment. Feed conversion improved with 30.58, 29.70 and 12.13%, respectively in lamb group T2, T3 and T4, when compared with the control group. Lambs fed diets containing treated rice straw with chemical or biological treatments did not affected feed cost, while lambs fed diets containing berseem hay recorded higher feed cost than the other feed regime. The body gain return of lambs group T2, T3 and T4 increased with 43.44, 43.44 and 14.75%, respectively than the control group. Also, the final margin figures were 72.70, 87.58 and 28.97%, respectively than the control group. All blood components were at the normal range at the whole experimental period. From the obtained results lambs fed diets containing treated rice straw with chemical or biological treatments recorded higher values of blood total protein, albumin, urea-N and AST. The albumin: globulin ratio increased in both lambs groups fed diets containing chemical treated rice straw and berssem hay than the other experimental groups.

Keywords: Lambs, chemical treated, biological treated, rice straw, growth rate, feed efficiency, digestibility, profit analysis.

***Corresponding author: Tel.:** +201006607022
E-mail address: xygamal@yahoo.com

INTRODUCTION

In Egypt sheep and goats industry is the least developed compared to other livestock industries. Feeds costs in sheep production the highest cost of the production requirements and may account 70-80% of costs. Nutrition is an important factor in sheep development, and a variety of nutrients are involved in proper growth and reproductive maturation (Abo El-Fadel *et al.*, 2011).

The shortage of feeds in general and protein in particular attract attention of many researchers to manipulate the unconventional sources of feeds. Most cultivated plants, grown with the purpose of production for commodities, yield considerable amounts of crop residues, which are not suitable for human consumption. Such residues usually contain high amounts of fibrous substances. In Egypt, more than 33 million tons of crop residues are produced annually. Sugarcane bagasse amount 3 million tons of these residues (Agriculture Economic and Statistics Institute, 2009). Though other part used for processing industrial materials, the higher ratio still wasted and mostly burned, hence lead to environmental pollution and consequently health hazards.

Rice is one of the most abundant crops in Egypt, 2 million feddans (EEAA, 2008) with an average production of about 6.12 million tons per year and 9.5 tons per hectare in 2005 (FAO, 2011). It is mainly cultivated in the northern east part of the country (El-Gammal and Shakour, 2001) especially in Kafr El-Sheikh, Al-Sharkia and Al-Dakahlia governorates (Agricultural Statistics, 2004). In Egypt, processing of rice in the river Nile Delta yields large amounts of rice straw as residue. About 20% was used for other purposes such as ethanol, paper and fertilizers production as well as fodders (El-Gammal and Shakour, 2001) and the remaining part was left on the fields for burning within a period of 30 days to get quickly rid of leftover debris. The resulting emissions significantly contribute to the air pollution called the Black Cloud (Keshtkar and Ashbaugh, 2007).

The primary factors limit utilization of crop residues are low digestibility, low protein content, high crude fiber and low palatability. Their low digestibility due generally to the high fibrous contents consists mainly of 30-40% cellulose 25-35% hemicelluloses and 10-15% lignin on DM base (Theander and Aman, 1984). Thus, to increase digestibility of crop residues, it is important to release the linkage between cellulose, hemicellulose and lignin or to modify the compact nature of these tissues, so that lignified tissue might separate from non-lignified one. There have been attempts to do that by mechanical, chemical or biological treatments (Abo-Donia *et al.*, 2005; Sazzad and Sabita 2008 and Abedo *et al.*, 2009). Chemicals used to improve the utilization of rice straw may be alkaline, acidic or oxidative agents. Among these, alkali agents have been most widely investigated and practically accepted for application on farms. Basically, these alkali agents can be absorbed into the cell wall and chemically break down the ester bonds between lignin and hemicellulose and cellulose and physically make the structural fibers swollen (Chenost and Kayouli, 1997 and Lam *et al.*, 2001). These processes enable the rumen microorganisms to attack more easily the structural carbohydrates, enhancing degradability and palatability of the rice straw (Prasad *et al.*, 1998; Shen *et al.*, 1999 and Selim *et al.*, 2004). The most commonly used alkaline agents are sodium hydroxide (NaOH), ammonia (NH_4) and urea. Recent years, much interest has been forwarded to develop new biotechniques for improving the nutritive value of lignocelluloseics fibrous using biological treatment in solid substrate fermentation (SSF) under non-sterile conditions (Leopold *et al.*, 2008).

This study was conducted to evaluate the effect of chemical and fungal treatment on nutritive values of rice straw.

MATERIALS AND METHODS

The present study was conducted out at the department of Animal Production, Faculty of Agriculture, Zagazig University, Zagazig, Egypt. The practical work was carried out at sheep farm belongs to Animal Nutrition Research unit, Radiobiology Applications Department, Nuclear Research Center, Atomic energy Authority, Abu Zabeel, Qaluobia Governorate from August to November 2009, to investigate the effect of chemical and biological treatment of rice straw on performance of male

lambs, nutrient digestibility and some blood chemical constituents.

Twenty-eight Barki male lambs with average initial live body weight (LBW) of 31.75 kg and about five month of age were divided into four similar groups in live body weight and age (seven animals each). The first group (T1) was fed basal diets which composed of concentrate feed mixture (CFM) and untreated rice straw (RS), while the second group (T2) was fed basal diets which composed of concentrate feed mixture (CFM) and berseem hay (BH). The animals of the third and fourth groups (T3 and T4) were fed on the concentrate of first group (T1) plus either chemical treated rice straw (CTR) or biological treated rice straw (BTR), respectively. The formulation of concentrate feed mixture and its chemical composition was shown in Table 1.

Chemical Treatment of Rice Straw

Rice straw was chopped with electrical machine to 3-5 cm and every 100 kg was sprayed with solution contains two hundred liter of water mixed with (3 kg sugar cane molasses, 2.25 kg urea, 1kg ammonium sulfate,0.25 kg magnesium sulfate, 100 ml phosphoric acid and 200 g yeast). All these material were mixed well on plastic sheet 6m X 9m. This mixture was stirred and sprayed with water every two days for three weeks and sun dried for two weeks and stored until fed to animals.

Biological Treatment of Rice Straw

Trichoderma reesei and *Trichoderma viride* causing high protein yield and high degradation of cellulose and hemicellulose (Iconomou *et al.*, 1998), and it does not produce aflatoxins (Israilides *et al.*, 1994) were obtained from Microbiology Department, National Research Center, Dokki, Cairo, Egypt. The organisms were maintained on Potato Dextrose Agar (PDA) medium.

Three days age fungal culture in test tube (16 X 160 mm) was crushed in 10 ml sterilized distilled water. Rice straw was prepared as mention above except that microorganisms, which had been prepared previously and distributed on the full amount of rice straw and mixed well with the solution mentioned above. The biological treated rice straw was stirred and sprayed with water every two days for three weeks and sun dried for two weeks and stored until fed to animals.

The animals were fed daily 3% dry matter of their LBW and roughage: concentrate ratio was (30 : 70) to cover the requirements according to NRC (1994) allowances for fat-tailed coarse wool sheep. The daily diets were offered in two equal parts twice daily at 9.00 & 14.00 hour and water was available all the day. The animals were weighted biweekly to adjust the ration and calculate the average daily gain till the end of the experiment, which extended for fourteen weeks.

Blood samples were taken at 4, 8 and 12 weeks of the experimental period before morning feeding from the jugular vein. The samples were directly collected into vacuum tube and centrifuged at 3000 RBM for 20 min. Serum was separated into polypropylene tube and stored at -18°C until analysis for total proteins according to Witt and Trendelenburg (1982) and albumin according to Tietz (1986). Globulin values were calculated by the difference between total protein and corresponding values of albumin. Urea-N concentration was estimated by the method of Coulombe and Favrean (1963). Aspartate aminotransferase (AST) was determined as described by Reitman and Frankel (1957).

The digestibility trial was carried out at the end of the feeding trial. Four animals from each group were selected at random for evaluation of rations fed in feeding trial and study the effect of chemical and biological treatment of rice straw comparing with untreated rice straw and berseem hay on nutrient digestibility and nutritive value. The animals were placed individually in metabolic cages for 10 days as preliminary period followed by 7 days as collection period. The rations were offered daily and refusals if any were recorded every day. Total feces were collected daily and weight. Feces samples (10%) were sprayed with 10% H_2SO_4 and dried at 60°c for 24 hours. Then finally grounded and kept for chemical analysis. Total urine was individually collected in a glass bottle containing 100 ml. of diluted sulphuric

Table 1. Formulation of concentrate feed mixture and its chemical composition

Ingredients %	
Crushed corn	20.0
Wheat bran	25.0
Corn cobs	15.0
Rice bran	15.0
Cotton seed meal	14.4
Soybean meal	8.0
Dicalcium phosphate	1.0
Sodium chloride	1.0
Mineral mixture*	0.5
Vitamin AD_3E	0.1
Chemical composition on DM basis %	
DM	87.14
OM	93.12
CP	14.66
CF	15.83
EE	4.51
TDN	73.08

*Mineral mixture: each kg containing zinc7200 mg, cupper 1800 mg, iron 1800 mg, manganese 3600 mg, cobalt 18 mg, iodine 110 mg, selenium 18 mg, sodium 74.3 g, the carrier material (calcium carbonate) up to 1000 g.

acid (10%). Urine volume was recorded and a sample of 5% was taken and kept in the refrigerator until analysis at the end of collection period, composite samples of feed offered and feces were mixed separately, finally grounded and kept for chemical analysis. Also, water consumption was recorded daily.

Routine samples of roughage and experimental rations, besides faeces and urine were analysed for moisture, dry matter (DM), crude fiber (CF), crude protein (CP), ether extract (EE) and ash by the ordinary methods of AOAC (1990). Nitrogen free extract (NFE) of feed and fecal samples was determined by deference.

Economic evaluation was calculated as the following equation according to Ayyat (1991): Margin = Return from body gain weight - Feed cost. Other overhead costs were assumed constant. The price of one kg of concentrate diet was 1.85 LE, price on one kg bressem hay was 0.95 LE, the price of one kg rice straw was 0.15 LE and the price of selling of one kg live body weight of lambs was 30.0 LE.

The data were statistically analyzed with SAS (2002) according to the following model:

$$X_{ij} = \mu + A_i + e_{ij}$$

Where, μ is the overall mean, A_i is the fixed effect of i^{th} treatment and e_{ijk} is the random error.

Means were tested for significant differences using Duncan's Multiple Range test (Duncan, 1955).

RESULTS AND DISCUSSION

All digestibility coefficients as percentages of nutrients showed higher ($P<0.05$, 0.01 or 0.001) values with rations contained Berssem hay and chemical and biological treated rice straw as compared with untreated groups (Table 2). The improvement in DM digestibility coefficients percentages being 10.18, 7.77 and 7.83%, respectively for Berssem hay, chemical or biological treated rice straw when compared with the control group. The corresponding values of OM percentages were 17.46, 20.34 and 19.28%, respectively. The improvement in CP digestibility coefficients percentages were 46.88, 38.64 and 41.50%, respectively for Berssem hay, chemical or biological treated rice straw when compared with the control group, also the corresponding values of CF percentages were 18.33, 24.46 and 33.02%, respectively. The corresponding values of EE percentages were 8.97, 22.40 and 6.25%, respectively. The improvement in NFE digestibility coefficients percentages were 14.44, 14.30 and 10.14%, respectively for Berssem hay, chemical or

Table 2. Digestibility coefficients and nutritive value of lambs as affected by chemical and biological treatments of rice straw

Items	Treatment				Significance
	T1	T2	T3	T4	
DM	57.75±0.605	63.63±0.667	62.24±1.207	62.27±3.013	0.2133
OM	54.63±0.520^{b}	65.26±0.814^{a}	65.77±0.993^{a}	65.16±2.751^{a}	0.0026
ASH	37.05±0.794^{b}	49.20±1.056^{a}	35.50±2.777^{b}	40.71±5.280^{ab}	0.0494
CP	45.78±1.462^{b}	67.24±1.581^{a}	63.47±1.633^{a}	64.78±2.537^{a}	0.0001
CF	41.25±1.882	48.81±4.500	51.34±1.249	54.87±3.349	0.0804
EE	60.77±1.026^{b}	66.22±2.514^{b}	74.38±1.282^{a}	64.57±1.642^{b}	0.0019
NFE	63.79±0.556^{b}	73.00±3.086^{a}	72.91±1.438^{a}	70.26±2.638^{ab}	0.0771
TDN	52.21±0.691^{b}	60.65±0.696^{a}	60.56±0.826^{a}	59.61±2.447^{a}	0.0084
DCP	7.46±0.256^{b}	9.64±0.226^{a}	9.37±0.241^{a}	9.70±0.379^{a}	0.0010

Means in the same row within each classification bearing different letters are significantly (P<0.05) different.

biological treated rice straw when compared with the control group. The improvement in CP, CF and fiber fractions digestibility coefficients of over a wide range of law quality roughages due to fungus treatments were observed by El-Ashry *et al.* (1997), Fouad *et al.* (1998) and Kholif *et al.* (2005). Gorden (1985) found that roughages subjected to biological treatments increased digestibility of nutrients especially CF because biological treatments degraded crude fiber by cellulose enzymes produced by microorganisms during incubation of roughages. Khorshed (2000) reported that all biological treatments (*T.viridi*, *S. cerevisiae* or *T. viridi* + *S. cerevisiae*) increased (P<0.01) apparent nutrients digestibilities of DM, OM, CP, CF and NEE than the corresponding roughage control. Deraz and Ismail (2001) and Kholif *et al.* (2005) mentioned that fungus treatments had the effect of loosening legnocelluletic bonds and solubilize some of the hemicelluloses content.

The nutritive value of treated rations as TDN were the highest for lambs group fed diets containing Berssem hay and chemical or biological treated rice straw with 16.17, 15.99 and 14.17%, respectively when compared with the control group (Table 2). The corresponding values of DCP percentages were 29.22, 25.60 and 30.03%, respectively. Azzam (1992), Singh and Gupta (1994), Hammouda (1996) and Kholif *et al.* (2005) reported that biological treatment of roughages could increase the digestibility coefficients for most nutrients and thus their feeding values as TDN and DCP compared with untreated materials. Also, Deraz (1996) and Sabbah *et al.* (2006) showed that growing lambs fed on fungal treated roughages recorded highest daily gain compared with control groups. In addition, biological treatments are clear environment besides less possible negative side effects. In this respect, Deraz (1996) mentioned that, lambs fed biologically treated rice straw was more efficient and the rate of improvement in feed conversion ranged between 10 to 23%.

Final live body weight and gain significantly (P<0.01 or 0.001) affected with the treatments (Table 3). Final live body weight of lambs fed basal diets which composed of concentrate feed mixture and berseem hay (T2), the concentrate of first group plus chemical treated rice straw (T3) and fed on the concentrate of first group plus biological treated rice straw (T4) recorded higher live body weight with 12.04, 11.40 and 2.92%, respectively higher than those fed basal diets and untreated rice straw (T1; control group). Lambs on T2 and T3 recorded higher final live body weight. The chemical treatments of rice straw recorded the higher body weight than the biological treatments. Average daily gain at the whole experimental period of lambs in T2 group, T3 group and T4 recorded higher live body weight with 43.44., 43.44 and 14.75%, respectively higher than the control group (T1). Lambs on T2 and T3 recorded higher final live body weight. The chemical treatments of rice straw recorded the higher body weight than the biological treatments. Lambs group T2 and T3 recorded the higher relative growth (42.17 and 42.43 g/100 g live body weight, respectively) than the T4 and T1 groups (35.81 and 31.71 g / 100 g live body weight, respectively).

Table 3. Growth performance, feed efficiency and profit analysis of lambs as affected by chemical and biological treatments of rice straw

Items	Treatment				Significance
	T1	T2	T3	T4	
Initial body weight (kg)	31.86±0.340	32.00±0.488	31.71±0.286	31.43±0.481	0.7844
Final body weight (kg)	43.86±0.340^{b}	49.14±1.056^{a}	48.86±0.962^{a}	45.14±0.670^{b}	0.0001
Total gain (g/day)	0.122±0.003^{b}	0.175±0.009^{a}	0.175±0.011^{a}	0.140±0.008^{b}	0.0002
Relative growth rate	31.71±0.851^{b}	42.17±1.721^{a}	42.43±2.298^{a}	35.81±1.925^{b}	0.0005
Dry matter intake (g/h/d):					
Concentrate	991.67±4.410	987.50±7.500	1000.00±0.000	1000.00±0.000	0.1553
Roughage	196.67±10.138^{b}	339.00±29.905^{a}	218.58±32.359^{b}	231.00±24.675^{b}	0.0161
Feed conversion	8.128	5.643	5.714	7.143	-----
Feed cost (LE/lamb/day)	1.865	2.150	1.883	1.885	-----
Gain return (LE/lamb/ day)	3.660	5.250	5.250	4.200	-----
Margin (LE/lamb/day)	1.795	3.100	3.367	2.315	-----

Means in the same row within each classification bearing different letters are significantly (P<0.05) different.

The obtained results for chemical treatments were similar to That obtained by Rokbani and Nefzaoui (1993), who observed that urea treatment had little effect on weight gain; when straw was chopped, daily gain increased by 38 % and they suggested that diets based on treated or untreated straw were more suitable for feeding to sheep with a low performance potential or fed at maintenance level. On the other hand animals given rations containing biological treatment showed high growth rate, Salama *et al.* (2011) showed that the biological treatment of rice straw increased the growth rate. It could be concluded the possibility of replacing berseem hay (30% of the rations) by fungi treated bagasse in sheep ration without any adverse effect on lamb growth performance or feed utilization parameters. Also, Sabbah *et al.* (2006) showed that growing lambs fed on fungal treated roughages recorded highest daily gain compared with control groups. Lambs fed biological treated roughages were the most efficient groups followed by those fed chemically treated roughages.

Concentrate intake insignificantly affected with experimental treatments, while the roughage significantly affected (P<0.05). The roughages increased with 72.37, 11.14 and 17.46%, respectively in lamb group T2, T3 and T4, when compared with the control group. On the other hand feed conversion improved with the feeding treatment. Feed conversion improved with 30.58, 29.70 and 12.13%, respectively in lamb group T2, T3 and T4, when compared with the control group (Table 3). Lambs fed on hay or chemical rice straw recorded the best feed conversion. Salama *et al.* (2011) concluded the possibility of replacing berseem hay by fungi treated bagasse in sheep ration without any adverse effect on lambs growth performance or feed utilization parameters. The diets containing 72% treated rice straw (NH_3) was consumed in larger quantities and less feed was required per unit of gain when compared to results with untreated straw diets (Garrett *et al.*, 1979).

Lambs fed diets containing treated rice straw with chemical or biological treatments did not affected feed cost, while lambs fed diets containing berseem hay recorded higher feed cost than the other feed regime (Table 3). The body gain return of lambs group T2, T3 and T4 increased with 43.44, 43.44 and 14.75%, respectively than the control group. Also, the final margin figures were 72.70, 87.58 and 28.97%, respectively than the control group. Lambs fed diets containing the chemical treated rice straw recorded the higher final margin than the other groups. Deraz (1996); Fouad *et al.* (1998) and Sabbah *et al.* (2006) noticed that the lowest feed cost was recorded with animals fed biological treated roughages. El-Marakby (2003) cleared that, the feed cost per kg weight gain was decreased with lambs fed fungal treated wheat straw rations (50% CFM + spawning wheat straw *ad lib.*) and (25% CFM+ spawning

wheat straw *ad lib.*) rations, by 31.71 and 53.90%, respectively, compared with those fed the control ration.

All blood components were at the normal range at the whole experimental period. The blood parameters at the first month insignificantly affected with the feeding regime, except that blood total protein significantly ($P<0.05$) affected (Table 4). From the obtained results lambs fed diets containing treated rice straw with chemical or biological treatments recorded higher values of blood total protein, albumin, urea-N and AST. The albumin: globulin ratio increased in both lambs groups fed diets containing chemical treated rice straw and berssem hay than the other experimental groups. Also, The blood parameters at the second month insignificantly affected with the feeding regime, except that blood urea-N significantly ($P<0.05$) affected (Table 4). The obtained results lambs fed diets containing treated rice straw with chemical or biological treatments recorded higher values of blood total protein, albumin, urea-N and AST. Lambs fed diets containing berssem hay or treated rice straw recorded higher ratio albumin-globulin. At the third month the blood total protein, albumin and AST significantly ($P<0.05$ or 0.01) affected with the feeding regime, while blood globulin, albumin: globulin ratio and urea-N insignificantly affected (Table 4). The blood concentrations of each total protein and albumin increased in lambs fed Berssem hay and rice straw treated with chemical or biological treatments. El-Ashry *et al.* (1997); Khorshed (2000); Kholif *et al.* (2005) and Sabbah *et al.* (2006) reported that biological treatments increased serum total protein. Values of serum globulin were not affected by biological treatment. Bader (1993) fed rams on different levels of fungal treated wheat straw and reported that the values of serum total protein were; 6.94, 6.67 and 6.28 (g/dl) for control (G1), 50% fungal treated wheat straw (G2) and 75% fungal treated wheat straw (G3), respectively.

In conclusion treating rice straw by both chemical or fungus treatment led to increase the total roughage intake, this may be consequently reflected decreasing the daily feed cost and increased the final margin.

Table 4. Some blood parameters as affected by chemical and biological treatments of rice straw

Items	Treatment				Significance
	T1	T2	T3	T4	
At first month:					
Total protein	6.87±0.151^{c}	7.67±0.165^{ab}	7.39±0.133^{bc}	8.20±0.422^{a}	0.0123
Albumin	3.42±0.172	3.99±0.151	3.92±0.303	3.87±0.083	0.1912
Globulin	3.44±0.098	3.67±0.175	3.47±0.391	4.32±0.467	0.2206
Albumin : Globulin	1.00±0.067	1.10±0.088	1.27±0.311	0.93±0.093	0.5501
Urea-N	45.74±4.703	48.97±3.727	48.69±2.674	47.48±4.076	0.9317
AST	25.40±2.713	28.00±3.066	27.40±3.709	36.60±7.222	0.3450
At second month:					
Total protein	6.92±0.425^{b}	7.74±0.225^{ab}	6.96±0.275^{b}	7.90±0.216^{a}	0.0618
Albumin	3.47±0.539	4.38±0.055	4.02±0.299	4.35±0.220	0.2186
Globulin	3.45±0.427	3.37±0.227	2.93±0.297	3.55±0.119	0.4761
Albumin : Globulin	1.11±0.249	1.32±0.086	1.44±0.201	1.23±0.082	0.5821
Urea-N	41.23±3.000^{b}	47.19±1.864^{ab}	50.48±1.162^{a}	48.15±1.553^{a}	0.0306
AST	26.20±3.455	29.60±2.182	28.60±4.534	38.20±2.709	0.1007
At third month:					
Total protein	6.55±0.091	7.27±0.247	7.07±0.069	6.93±0.058	0.0140
Albumin	4.21±0.060	4.54±0.125	4.54±0.023	4.62±0.031	0.0043
Globulin	2.35±0.101	2.74±0.352	2.53±0.069	2.31±0.069	0.3850
Albumin : Globulin	1.81±0.090	1.80±0.300	1.80±0.051	2.01±0.067	0.7563
Urea-N	48.36±1.851	45.38±1.339	49.57±1.104	44.32±0.784	0.0613
AST	34.20±1.319	36.60±1.631	34.20±1.934	43.00±2.345	0.0118

Means in the same row within each classification bearing different letters are significantly ($P<0.05$) different.

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تأثيـــر المعاملـــة البيـــولـــوجيـــة والكيميائيـــة لقـــش الأرز علـــى معـدل الأداء للحمـــلان

إسماعيل محمد عبد الهادى عبد الرازق - جمال الدين على عبد الرحمن - محمد صلاح عياط

قسم الإنتاج الحيوانى - كلية الزراعة - جامعة الزقازيق

صممت هذه الدراسة في قسم الإنتاج الحيواني، كلية الزراعة، جامعة الزقازيق، الزقازيق، مصر. وتم تنفيذ التجربة العملية في مزرعة تربية الأغنام التابعة لوحدة بحوث تغذية الحيوان، مركز البحوث النووية، هيئة الطاقة الذرية فى أبو زعبل، محافظة القليوبية من أغسطس إلى نوفمبر ٢٠٠٩. تم تقسيم ثمانية وعشرين من حملان البرقى الذكور، متوسط وزن الجسم الحي فى البداية حوالى ٣١,٧٥ كجم أعمارها حوالى خمسة أشهر. قسمت تلك الحيوانات إلى أربع مجموعات متماثلة في وزن الجسم الحي (سبع حيوانات لكل منها). تم تغذية المجموعة الأولى (T1) على عليقة تتكون من خليط من العلف المركز وقش الأرز الغير المعالج، في حين أن المجموعة الثانية (T2) تم تغذيتها على ذات العليقة مع دريس البرسيم. تم تغذية الحيوانات من المجموعات الثالثة والرابعة (T3 و T4) على العليقة السابقة من المجموعة الأولى (T1)، بالإضافة إلى قش أرز معامل كيماويا أو بيولوجيا، على التوالي. التحسن في معدل هضم المادة الجافة يرتفع بمعدل ١٠,١٨، ٧,٧٧ و ٧,٨٣٪ على التوالي فى المجموعات T2 ، T3 ، T4 عند مقارنتها مع مجموعة المقارنة. وكانت القيم المناظرة لمعدل هضم المادة العضوية هو ١٧,٤٦، ٢٠,٣٤ و ١٩,٢٨٪ على التوالي. التحسن في معدل هضم البروتين هو ٤٦،٨٨، ٣٨،٦٤ و ٤١،٥٠٪ على التوالي فى المجموعات T2 ، T3 ، T4 عند مقارنتها مع مجموعة المقارنة، وأيضا القيم المناظرة لمعدل هضم الألياف الخام تحسنت بنسبة ١٨,٣٣، ٢٤,٤٦ و ٣٣,٠٢٪ على التوالي. وكانت القيم المناظرة لمعدل هضم الدهن هى ٨,٩٧، ٢٢,٤٠ و ٦,٢٥% على التوالي. معدل تحسن TDN هو مع ١٥,٩٩، ١٦,١٧ و١٤,١٧٪ على التوالي فى المجموعات T2 ، T3 ، T4 عند مقارنتها مع مجموعة المقارنة. وزن الجسم الحي النهائي للحملان التى تتغذى على خليط العلف المركز ودريس البرسيم (T2)، أو مع العليقة المركزة بالإضافة إلى قش الأرز المعالجة الكيميائية (T3)، أو مع العليقة المركزة بالإضافة إلى قش الأرز معاملة بيولوجية (T4) سجلت أعلى وزن الجسم الحي نهائى بمقدار ١٢,٠٤، ١١,٤٠ و ٢,٩٢٪ على التوالي عند المقارنة مع تلك التي تغذت على عليقة مركزة مع قش الأرز الغير معالج (T1، مجموعة المقارنة). الزيادة اليومية في الفترة التجريبية الكلية فى من الحملان في مجموعة T2، والمجموعة T3 والمجموعة T4 سجل زيادة فى معدل النمو بمقدار ٤٣,٤٤ و ٤٣,٤٤ و ١٤,٧٥٪، على التوالي عند المقارنة مع المجموعة T1. سجلت الحملان في المجموعة T2 و T3 أعلى معدل نمو يومى عن باقى المجاميع التجريبية. معدل التحويل الغذائى تحسن بمعدل ٢٩,٧٠، ٣٠,٥٨ و ١٢,١٣٪ على التوالي في حملان المجموعات T2، T3 و T4 وذلك بالمقارنة مع مجموعة المقارنة. سجلت الحملان المغذاة على دريس البرسيم أو قش الأرز المعامل كيماويا أفضل معدل تحويل غذائى. تكلفة التغذية لم تتأثر فى الحملان نتيجة المعاملة البيولوجية أو كيميائية، في حين الحملان التى تغذت على دريس البرسيم سجلت ارتفاع ملحوظ فى تكلفة التغذية. زيادة العائد من النمو فى حملان المجموعات T2، T3 و T4 بمعدل ٤٣,٤٤، ٤٣,٤٤ و ١٤,٧٥٪ على التوالي من عن مجموعة المقارنة. وكانت معدل الزيادة فى الربح هى ٧٢,٧٠، ٨٧,٥٨ و ٢٨,٩٧٪ على التوالي. سجلت الحملان التى تتغذى على نظام غذائى يحتوي على القش المعامل كيماويا أعلى معدل ربح عن المجموعات الأخرى.