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Effect of Barley Straw Treatment with Probiotic on Some Productive Characteristics.

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ABSTRACT

This experiment was conducted to study the effect of treating barley straw with Probiotic on some productive characteristics. Ten Awassi lambs were used average initial weight of 38±0.50 kg and aged 8-9 months. Lambs were divided randomly into two equal groups, then put in separate individual pens. Each group fed on roughages (barley straw), as follows: The first group was a control, and the second group fed on barley straw treated with Probiotic at rate 0.25% (2.5 kg / tones). the experience was the use of (CRD). The results showed different effects among treatments as follow: The Probiotic was a significant increase ($P < 0.05$) in weight gain in (1 - 14 d) compared with control, and was a significant increase ($P < 0.05$) in feed conversion ratio compared with control. Found a significant decrease ($P < 0.05$) in weight gain in (29 - 42 d) with Probiotic compared with control, and a significant decrease ($P < 0.05$) in Intake of hemicellulose compared with control, as well a significant decrease ($P < 0.05$) in vivo digestibility of crude fiber compared with control. The other traits were not significantly affected with treatment. We conclude that the treatment with Probiotic were improved feed conversion ratio, while not improved feed intake, intake of different nutrients, weight gains, digestibility and rumen fermentation (pH and NH3-N concentration).

Keywords: Probiotic, Barley Straw, treatment.

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INTRODUCTION

Raising sheep in Iraq are suffering a lot of obstacles and problems. One of the most important problems is feeding where down spaces pastures as well as low areas allocated for cultivation of green fodder, are not consistent with the needs and the requirements of Animals (Al-Saady, 2009). So many researchers resort to use low quality forages that characterize with low nutritive value and contain high percentage of lignin (Mahesh and Mohini, 2013).

Many treatments were conducted to improve the nutritional value of low quality feeds including physical, chemical treatments (Al-Zubaidi, 2006). However, the improvement in chemical parameters was associated with increased phenolic compounds, reduced numbers of anaerobic bacteria, increased pH, and increased free lignin This affects microbial activity within the animal's crust, affecting the manufacture of microbial proteins (Hassan et al., 2007). Also biological treatments, which helps to break link between lignin and cellulose and increase cellulose for ease using it by ruminant animals (Mahesh and Mohini, 2013).

The researchers resorted to the use of food additives to improve the environment of rumen, such as Probiotic, which are important food additives in ruminants. Probiotic is positive impact in the digestion process and improve the efficiency of utilization of feed by increasing the ability of bacteria to benefit from food compounds, and identify the growth, and activity of microorganisms harmful (Shams Eddine et al., 2014). The Probiotic works to improve the rumen environment and provide suitable conditions for growth of microorganisms and pH stability. Therefore, this improvement will increase the ability of ruminants to benefit from feed (Al-Saady, 2009)

Since all studies have been used as biochemical booster and gave good results, we decided to study the use of the booster as a treatment to try to improve the straw before the animal Therefore; the purpose of this study was to know the effect of feeding barley straw treated with Probiotic on the performance of Awassi Lambs.

MATERIALS AND METHODS

This study was conducted in the farm of Ruminants Research Station / Office of Agricultural Research / Ministry of Agriculture / in Abu Ghraib – Baghdad. The experiment continued for 56 days in addition to 14 days as introductory period, from 11/10/2015 until 06/12/2016.

The purpose of the study

Studying the effect of the treating barley straw with probiotic (Saccharomyces cerevisiae) on some productive characteristics (feed intake, average daily gain and feed conversion ratio) digestibility, and rumen characteristics (ruminal pH and ammonia–N concentration)

The preparation of forage components

Table1: The chemical composition of barley straw (T_1), treated barley straw (T_2) and concentrate diet (% of dry matter)

Contents (%)	T_1	T_2	Concentrate
DM	90.83	91.35	89.91
CP	4.17	3.97	12.33
CF	64.47	61.82	13.31
EE	1.38	1.31	5.23
NFE	15.52	18.66	61.40
ASH	14.46	14.23	7.72
NDF	17.94	61.59	13.52
ADF	21.66	45.25	22.56
ADL	63.68	23.81	41.1
ME MJ/kg DM	2.82	2.98	10.48

ME (MJ/kg DM) = [- 0.45 + (0.04453×% TDN)] × 4.184 (Kearl, 1982)
TDN (% of DM) = -17.2649+1.2120(%CP) + 0.8352 % NFE+2.4637% EE+0.4475 %CF

Forage Lambs fed individually on a unified concentrate diet (2.5% of body weight). While, the roughages offered ad libitium and samples took of it for chemical analyzes. Table1 shows the chemical composition of barley straw and concentrate diet.

Method of treating barley straw

Barley straw was divided into three groups where humidity was lifted to 70% by spraying water on barley and sections had treated as follows- :

- The first group did not treated and used as control group.
- The second section has treated with 0.25% probiotic (2.5 kg / ton) .

Barley straw and probiotic were well distributed. After spraying ended barley straw covered by a black polyethylene sheets to prevent air and sun light, left for two weeks and then polyethylene bags was removed. Barley straw lifted to dry for using it and submitting to the experimental animals.

Growth trial

Ten Awassi lambs were used in this experiment with average initial weight 38 ± 0.50 kg and age 8-9 months. Lambs were divided randomly into two equal groups (5 each) then kept in individual pens (1.25 × 1.25 m) and numbered according to transactions. All lambs fed individually on a unified concentrate diet. The adaptation period amounted 14 days where fodder offered gradually. The roughages were introduced separately from concentrate diets at 8:00 am. The concentrate diets provided at 12:00 pm to ensure consuming a larger amount of roughages.

The remained roughages and concentrate were collected daily in the morning before start feeding for calculating the amount of daily feed intake. The animals were weighed every two weeks before the morning feeding and periodically at the beginning of the experiment to the end.

Digestion trial

Experiment was conducted to estimate digestibility coefficients during the seventh week of experiment with all animals. Feces were collected for 7 days at morning before provision of food by using bags (locally made from flour bags containing small holes at the bottom) to collect feces, then weighed by electronic balance, samples took and put in small and clean plastic bags to save in the fridge. The process was repeated on the second day, and so for a period of 7 days, samples kept in the refrigerator (freeze) until chemical analyzes.

Chemical analysis

Chemical analysis of feed and feces applied to found dry matter (DM), organic matter (OM), Ash, crude protein (CP), crude fiber (CF), ether extract (EE) (AOAC, 2005), neutral detergent fiber (NDF), acid detergent fiber (ADF), acid detergent lignin (ADL), (Goering and Van Soest, 1970), cellulose and hemicelluloses.

Rumen fermentation characteristics

Rumen liquor samples were collected from lambs during the fifth week of the experiment. They were withdrawn at zero time (just before feeding), then at 3 h and 6 h post morning feeding to study rumen fermentation characteristics through the determination of the ruminal pH, and NH3-N concentrations.

Samples were withdrawn from the same animals in all sampling time by using a smooth rubber stomach tube which connected to Hand Operated Siphon Pump (SI-60) and inserted into the rumen via the esophagus as described by (Saeed, 2011). Rumen liquor was strained through four layers of cheesecloth to discard the solid unfermented particles and immediately measured for pH using Portable digital pH meter (ph-

80) after adjusting with standard pH buffer solutions (pH=7). After that, a retention of about 10 ml of the rumen liquor was kept and 2-3 drops of toluene added to prevent fermentation. The samples stored at -20 °C until analysis. (Filípek and Dvořák, 2009).

Statistical analysis:

The experimental data analyzed in a complete randomized design (CRD) and compared the moral differences between the averages by Duncan test multi – border (Duncan, 1955) using statistical program SAS (SAS, 2012) in the analysis.

RESULTS AND DISCUSSION

Feed and nutrient intake

Table 2 shows that treatment with probiotic did not have any significant effect on the amount of feed intake, dry matter (DM), crude protein (CP), crude fiber (CF), ether extract (EE), cellulose, neutral detergent fiber (NDF), acid detergent fiber (ADF) and acid detergent lignin (ADL). While found significant decrease (P <0.05) in hemicelluloses with probiotic compared with control (107.14 and 160.71, respectively)

These results were not consistent with results of Al-Saady (2009) who pointed out that the use of probiotic or some other food additives may lead to improved environmental conditions within the Rumen and thus increase the activity and growth of microorganisms within the Rumen and this cycle will reflect positively on the daily intake of feed. The decrease in hemicellulose may be due to the increase in the number of bacteria analyzed and therefore consumption by these microorganisms, which led to the decline while not affected by the rest of the elements.

Table 2: Effect of treatment with probiotic on feed and nutrient intake

Treatments / Intake Kg/d	Control	**probiotic** treated group	signif
Roughages	34.02 ± 2.86	29.24 ± 3.41	NS
Concentration	57.63 ± 1.32	55.65± 1.26	NS
Total	91.65 ± 3.89	84.89 ± 4.40	NS
DM	30.90 ± 2.60	26.71 ± 3.12	NS
CP	1.29 ± 0.11	1.06 ± 0.12	NS
CF	19.92 ± 1.67	16.51 ± 1.93	NS
EE	0.43 ± 0.04	0.35 ± 0.04	NS
Cellulose	6.11 ± 0.51	6.27 ± 0.73	NS
Hemicelluloses	7.37 ± 0.62 a	4.78 ± 0.56 b	*
NDF	21.67 ± 1.82	18.01 ± 2.10	NS
ADF	14.30 ± 1.20	13.23 ± 1.55	NS
ADL	8.19 ± 0.69	7.96 ± 0.81	NS

* = significant (P <0.05), NS = non-significant

Daily gain and feed conversion ratio

Table 3 shows the treatment with probiotic did not have any significant effect in average daily gain weight, daily gain in (15 – 28 d), (43 – 56 d), final weight and total weight. Found significant increase (P <0.05) in daily gain weight (1 – 14 d) (71.43 178.57, respectively) While found significant decrease (P <0.05) in weight gain in (29 – 42 d) with probiotic compared with control (71.43 and 160.71, respectively) The results show significant decrease (P <0.05) in feed conversion ratio with probiotic compared with control (14.97 and 17.29, respectively). Although the efficiency of food conversion improved but we note that there is no significant increase in weight, this may be due to the amount of feed consumed. We note a decrease in feed consumption in the treatment of Probiotics, but this decrease is not significant but rather arithmetically, As well as not to

improve digestion coefficient has an impact in terms of ruminant take advantage of the necessary elements needed by microorganisms to manufacture microbial protein.

Table 3: Effect of treatment with probiotic on average final weight, total gain, daily gain and feed conversion ratio

Treatments / Characteristics	Control	**probiotic**	Signif
Initial weight (kg)	38.53 ± 4.34	38.17 ± 3.48	NS
Final weight (kg)	43.83 ± 2.40	43.83 ± 3.11	NS
Daily gain weight (gm)	94.64 ±13.25	101.25 ± 12.30	NS
gain weight (gm)			
1 – 14 d	48.33 ± 1.67 b	71.43 ± 1.62 a	*
15 – 28 d	250.00 ± 9.71	166.67 ± 1.81	NS
29 – 42 d	160.71 ± 10.31 a	71.43 ± 1.62 b	*
43 – 56 d	142.86 ± 7.55	130.95 ± 1.81	NS
Total gain weight	5.30 ± 0.16	5.67 ± 1.01	NS
Feed conversion ratio	17.29 ± 1.30 a	14.97 ± 2.06 b	*

* = significant (P <0.05), NS = non-significant

In vivo Digestibility

Table 4 shows that treatment with probiotic did not have any significant effect on the digestibility of dry matter (DM), crude protein (CP), ether extract (EE), cellulose, hemicelluloses, neutral detergent fiber (NDF), acid detergent fiber (ADF) and acid detergent lignin (ADL). While found significant decrease (P <0.05) digestibility of crude fiber (CF) with probiotic compared with control (68.28 and 51.28, respectively)

These results were not consistent with El-Menniawy (2008), who reported that the biological treatment of fiber-rich feedings improved the dry matter digestion, ether extract, and acid detergent lignin. The rate of degradation of nutrients in the rumen may be affected by several factors, including animal factors, reduced the size of the feed by rumination, microbial activity and rumen status (pH, osmotic pressure and the average duration of forage survival within the rumen), which have a significant effect on microbial activity (Lopez et al., 1995). It seems that the treatment either did not positively affect the growth of cellulosic bacteria or that the treatment could not break the link between cellulose and lignin to facilitate the microorganisms in the rumen utilization of cellulose.

Table 4: Effect of treatment with probiotic on digestibility

Treatments / Digestibility %	Control	**probiotic** treated group	Sign
DM	56.38 ± 3.84	57.84 ± 0.27	NS
CP	64.74 ± 1.05	63.84 ± 0.47	NS
CF	68.28 ± 2.47 a	51.28 ± 1.95 b	*
EE	69.82 ± 0.44	71.25 ± 0.34	NS
Cellulose	72.68 ± 6.41	71.34 ± 2.20	NS
Hemicelluloses	70.09 ± 2.47	72.82 ± 2.90	NS
NDF	60.55 ± 3.02	60.96 ± 1.44	NS
ADF	61.78 ± 3.60	63.13 ± 0.70	NS
ADL	62.59 ± 0.20	63.54± 3.94	NS

* = significant (P <0.05), NS = non-significant

Rumen fermentation

Table 5 shows that treatment with probiotic did not have any significant effect on rumen fermentation (pH and NH3–N concentration) at all collection times. The addition of the fungus can work to stabilize the pH of the rumen in the first place by encouraging the growth bacteria consumed lactic, which is

responsible for the reduction of the concentration of lactate in the rumen (Williams et al., 1991). It is clear that the treatment in our study did not induce this effect and encouraged the growth of bacteria consuming lactate.

The persistence of the concentration of ammonia nitrogen in the rumen may indicate that the treatments did not improve the nutritional value of barley straw, which may be due to the possibility that the concentration of substances used in the treatment is low or the effect of incubation period (increase or decrease). The results showed that the amount of raw protein and the digestion coefficient was not affected with the treatment; therefore, it did not affect the concentration of ammonia nitrogen and was not significant in the treatment.

Table 5: Effect of treatment with probiotic on Rumen fermentation

Periods / Treatments	0	3h	6h
pH			
Control	6.35 ± 0.05	5.80 ± 0.30	5.65 ± 0.25
Probiotic	6.30 ± 0.10	5.80 ± 0.10	5.70± 0.10
Significantly	NS	NS	NS
NH_3-N mg / dcl			
Control	24.52 ± 3.51	28.02 ± 3.00	24.52 ± 3.51
Probiotic	24.52 ± 3.51	21.01 ± 2.13	21.02 ± 3.01
Significantly	NS	NS	NS

NS = non-significant

CONCLUSIONS

The treatment with probiotic improved feed conversion ratio, and did not have any positive effects on productive characteristics (feed intake, Intake of nutrient, in vivo digestibility, and rumen fermentation (ruminal pH and ammonia–N concentration). This means that the treatment did not improve the nutritional value of barley straw, which may be due to several reasons, including reasons related to the animal itself. or the reasons for treatment with the booster, such as the possibility that the concentration of materials used in the treatment of a few or the effect of the incubation period (increase or decrease.(

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