Effect of different levels of treated roughage and un-degraded concentrate on rumen parameters of Arabi ewes

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SUMMARY

The present study was conducted at the Animal Farm/ College of Agriculture/ University of Basrah during the period from 2/12/2012 to 2/3/2013. The study included 24 milking ewes aged around 2-4 years, having single lamb, closely lambing date and weighted 42 kg. After giving the ewes preliminary period of 10 days, they were distributed randomly and equally to six feeding groups. The first group was fed 60% concentrate and 40% roughages; soya bean meal was treated by formaldehyde. The second group was fed 60% concentrate and 40% roughages with untreated soya bean meal. The third group was fed 50% concentrate and 50% roughages with treated soya bean meal. The fourth group was fed 50% concentrate and 50% roughages with untreated soya bean meal. The fifth group was fed 40% concentrate and 60% roughages with treated soya bean meal. The sixth group was fed 40% concentrate and 60% roughages with untreated soya bean meal (control). The ration was given as 4% of live body weight. The concentrate consisted of 40% barley, 20% corn, 30% wheat bran, 7% soya bean meal, 1% salt and 2% Calcium bicarbonate. Roughage was wheat straw treated with 4% urea and 3kg/ton yeast. Treated soya bean meal reduced degradable protein from 70% to 60%. There were no significant differences among feeding groups in pH, total bacteria and cellolytic bacteria before feeding. However, the differences reached significant level ($P<0.05$) after 3 hours of feeding. The third group recorded highest pH value (6.82) and cellolytic bacteria ($8.7x\ 10^6$). The fifth and sixth groups showed highe significant improvement in total number of bacteria when compared with other groups ($11.37x10^7$ and $11.86x10^7$).Propionic acid level and the percentage of acetic: propionic were significantly ($P<0.05$) influenced by different treatments, comperation with fivth and sixth treatment.

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Key word: treated roughage, undegraded concentrate , fatty acid, pH

Introduction

When preparing of ruminant diets there is a need to be equipped with adequate amounts of protein degraded in the rumen to fulfill the growth of rumen microbes to the fullest extent or to a higher amount of fermentation, to provide a sufficient amount of protein reach the intestine from microbial protein and filling the requirements of amino acids of the animal (1; 2). The composition of diets depends on the real measurement of crude protein level in feed materials which degrade in the rumen (3; 4).

High producing ruminant supplied with some individual amino acids under some circumstances to meet their needs (5). Degradation of proteins in the rumen by bacterial enzymes (protozoa lapidate) produce peptides and amino acids and ammonia, which is one of the main sources of nitrogen, which need bacteria rumen and thus it affect the growth rates of neighborhoods in the rumen (6; 7) for most types of rumen bacteria the ability to analyze protein (8). The bacteria have the ability to decomposition of cellulose (9; 10). On the other hand, protozoan has the capacity to analyze the protein also (8); type and number of microbiology affect the rate of decomposition of protein in the rumen. It is important to provide a sufficient amount of protein degraded in the rumen to meet the needs of the bacteria to produce the largest amount of microbial protein with essential amino acids (7; 11). Crude protein in the feed is important as a nitrogen source in the rumen (6) and in the feed, which suffers from a lack of protein degraded in the rumen, like most grains, the microbial fermentation be limited, which has a negative impact on digestion of fiber in the rumen (12). There is little benefit to raise the level of protein degradable or un-degradable when formulation diets with higher levels of protein desired (13). Foods contain low degradable proteins in the rumen is particularly important for ruminants that need high protein level in their diet (3).

The aim of this study was to determine the effect of concentrate feed to the coarse and protected protein in the rumen on rumen parameters.

Materials and methods

This study was conducted in the Animal Farm of the Faculty of Agriculture / University of Basra for the period from 2/12/2012 until 03/02/2013. The study involved feeding and digestion trails. The study

involved 24 milking Arabi ewes aged 2-4 years and weighted 42 kg with single and close lambing. Ewes were placed and their new borns under veterinary care for the duration of the study. Veterinary care included tetramezol against internal and external worms and Albendazole against liver worms and nematodes and tapeworms (15 ml / ewe). Ewes were also vaccinate against foot and mouth disease FMD (1 ml subcutaneously). After giving the ewes' adaptation period for 10 days, they were distributed randomly into six groups (nutritional) with four replicates of each group:

1- Fed 60% concentrate (soybean treated with formaldehyde) +40% roughage.
2- Fed 60% concentrate (soybean untreated with formaldehyde) +40% roughage.
3- Fed 50% concentrate (soybean treated with formaldehyde) +50% roughage.
4- Fed 50% concentrate (soybean untreated with formaldehyde) +50% roughage.
5- Fed 40% concentrate (soybean treated with formaldehyde) +60% roughage.
6- Fed 40% concentrate (soybean untreated with formaldehyde) +60% roughage (Control).

Diets were given on the basis of 4% of ewe's body weight. Concentrate diet consisting of 40% barley, 20% corn, 30% wheat bran, 7% soybean meal (SBM), 1% salt and 2% limestone. Roughage feed consists of hay has been treated with 4% urea 4with the addition of bread yeast at a rate of 3 kg / tone. A total of 4 kg of urea (46%) was dissolved in 40 liters of water and then spray this solution to 100 kg of hay. After it has been mixed well it was packaged in plastic bags to prevent leakage of ammonia gas output by the decomposition of urea. The product has been store for a period of 15 days. After bags has been opened and dissemination of hay on the tiled floor of the ventilation and get rid of the harmful effects of ammonia for 24hrs. SBM was treated with formaldehydes which gives a proportion of un-degradable: degradable protein in the rumen from 30:70 (non-treated) to 40:60 (treated with formaldehyde) as described by Saeed (14).

Rumen solution was taken from the rumen by gastric tube inserted in to the rumen and vacuum by a large syringe once a week before eating

and after three hours of feeding and then analyzes. Rumen content pH was measured by digital PH meter 9909 pw Philips. Volatile fatty acids were measured at the Department of Food Sciences and Biotechnology / College of Agriculture / Basrah University by GC Mass device manufactured by the Japanese company SHIMADZU. Total number of bacteria and cellolytic bacteria were cultivated and measured as (15):

The number of bacterial cells / cm^3 of the original sample = number of colonies in the dish × inverted dilution of sample

Data were statistically analyzed using a Completely Randomized Design for six treatments. Differences among means were tested by using Revised Least Significant Differences by using the statistical software SPSS (16).

Results and Discussion

Table (1) shows the lack of significant differences between treatments in the pH and total bacteria and cellolytic bacteria before eating. While there was a significant difference ($P<0.05$) to the same parameters after eating as third treatment (50% feed center +50% feed roughage and SBM treatment formaldehyde) recorded the highest value of pH (6.82) and the highest number of cellolytic bacteria ($8.7x10^6$) (table, 2).while fifth and sixth treatments gave significant superiority in numbers of bacteria compared with the rest of treatments ($11.37x10^7$) and ($11.86x10^7$) respectively.

It can be seen from the pH value after eating of different treatments, the level was within the normal level for the growth of microorganisms in the rumen (5.8and above). These findings were in agreement with that of (17), where they found that the pH value in ewe's rumen fed fishmeal containing SBM treated with formaldehyde was 5.6-5.8. Rumen pH can be changed from (5) in feeds that contain high proportions of grain to more than (7) in the coarse feed (18) Results showed decrease in rumen pH when increasing the concentrate feed to 60% of untreated formaldehyde (second treatment) and lower pH value (6.19). Fourth and control groups, which concentrate was used as 50% and 40% respectively and not been treated formaldehyde, gave pH values did not differ significantly (6.37 and 6.48 respectively). These results differ with those obtained by (13) who use feed containing different ratios of corn and

barley, they recorded low pH in the rumen not less than (6.29). But when SBM treated with formaldehyde even in the highest percentage in the concentrate, the pH value was not significantly affected by which demonstrates that the non-hydrolyzed protein leads to the stable high pH. Number and types of microbes relies primarily on the pH in the rumen. Third treatment showed highest number of bacteria decomposing cellulose and higher pH because rumen microbes rely on easily available sources of carbon and nitrogen. Whenever carbon and nitrogen are available there is greater microbes' growth and this reflected by the fifth and sixth treatments, which use the 40% of concentrate. As concentrate contributed by available carbohydrates, while straw treated with urea was a good source of nitrogen and therefore gave the highest numbers of cellolytic and total bacteria. Digestion of organic matter in diets containing high levels of concentrate is determined by both pH and the activity of microorganisms in the rumen (17). Recent studies have pointed out that the increase of using active dry yeast in feeding ruminant feed additives lead to improving the efficiency of feed conversion and performance of the animal, especially high output by adjusting the microbial balance when feeding high energy diets containing high levels of concentrate diets (19)

Table (1). Mean of pH, total number of bacteria and cellolytic bacteria of different treatments before 3 hours of feeding

Treatment	**cellolytic bacteria**	**Total bacteria**	**pH**
group1	3.03×10^{6}	3.30×10^{7}	6.84±0. 1
group 2	2.73×10^{6}	3.37×10^{7}	6.48±0. 1
group 3	2.85×10^{6}	3.26×10^{7}	6.48±0. 1
group 4	2.83×10^{6}	3.57×10^{7}	6.48±0. 1
group 5	2.86×10^{6}	3.76×10^{7}	6.49±0. 1
group 6 (control)	3.05×10^{6}	3.48×10^{7}	6.49±0. 1
	NS	NS	NS

Table (2) Mean of pH, total number of bacteria and cellolytic bacteria of different treatments after 3 hours of feeding

Treatment	cellolytic bacteria	Total bacteria	pH
group 1	5.77×10^{6b}	6.70×10^{7c}	$6.40^{c}\pm0.05$
group 2	5.21×10^{6b}	6.63×10^{7c}	$6.19^{d}\pm0.08$
group 3	8.70×10^{6a}	10.67×10^{7b}	$6.82^{a}\pm0.03$
group 4	5.98×10^{6b}	6.41×10^{7c}	$6.37^{c}\pm0.05$
group 5	8.68×10^{6a}	11.37×10^{7a}	$6.67^{b}\pm0.06$
group 6 (control)	8.98×10^{6a}	11.86×10^{7a}	$6.48^{c}\pm0.06$

Propionate and propionate: acetate ratio were significantly ($P<0.05$) affected by different rations given to the ewes (table, 3). The first fourth treatments exceeded the fifth and sixth treatments. The reason behind that may be to the high level of concentrate in these diets. Propionate production in the rumen is influenced by the increase of concentrate consumption diets even there is increase in the levels of other volatile acids (20). Acetate: propionate ratio is also affected by the difference in propionate level, as all nutritional treatments exceeded control group, increasing the proportion of concentrate feed lead to increase level of propionate and lactic acid (21). Change the type of fatty acid in the rumen illustrates the benefit of nutritional modifications made to the animal, the increase production of propionate acid at increasing the proportion of concentrate feed led to a decline in the proportion of acetate acid (22) although there was no significant differences in the concentration of acetate acid in this study was observed, but an numeric increase in its concentration. Production of propionate is mainly by bacteria in the rumen (23). pH value in the rumen reflect rate of carbohydrate fermentation, absorption of volatile fatty acids and buffer conditions (24), as pH value did not reduce than (6) which is suitable for the growth of all types of bacteria in the rumen .Concentrate diet provide essential energy needed for the growth of microorganisms in the rumen (25). Increase starch fermentation causes an increase in the concentration of volatile fatty acids and an increase in the number of bacteria in the

rumen, increasing volatile fatty acids resulting from the increase of propionate acid and the production of L-malic acid which negatively affect the activity of protozoa (26). Type and proportion of volatile fatty acids in the rumen depend on the type of microbes and conditions of fermentation and type of rations, particularly the proportion of the concentrate to roughage (27). In addition to that the rates of volatile fatty acids are controlled by Thermodynamic factors such as the production of ATP (28). Time after feeding has a significant effect on the concentration of volatile fatty acids in the rumen, as these acids levels are low before feeding and current results are in consistent with the results of (27). When feeding buffalo calves roughages diets treated with urea led to increase in the concentration of total volatile fatty acids ($P < 0.01$) and acetate ($P < 0.01$) and the proportion of acetate: propionate ratio ($P < 0.05$) compared to the control group(24).

Table (3) Levels of volatile fatty acids (mmol / l) in ewes' rumens fed different diets

Treatment	Total volatile fatty acids	Butyric	propionate	Acetate	ratio Acetate: propionate
group 1	63.51±6.71	7.11±0.66	12.15^{a} ±1.10	43.12±3.20	3.55 ^{b} ±0.29
group 2	65.22±6.62	8.52±0.65	12.01 ^{a} ±1.31	44.40±4.11	3.69 ^{b} ±0.32
group 3	63.67±6.51	6.45±0.60	10.64 ^{a} ±0.92	45.31±3.75	4.26 ^{b} ±0.34
group 4	65.38±6.32	7.14±0.61	10.40 ^{a} ±0.93	46.22±3.63	4.44 ^{b} ±0.33
group 5	63.24±6.33	6.11±0.55	8.50 ^{b} ±0.78	47.26±4.09	4.54 ^{b} ±0.37
group 6 (control)	64.89±6.42	6.33±0.45	8.06 ^{b} ±0.72	49.37±4.25	6.13 ^{a} ±0.56
	NS	NS		NS	

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تأثير أستخدام نسب مختلفة من العلف الخشن المعامل والعلف المركز المخفض تحلله في الكرش على معايير الكرش في النعاج العرابية

جلال عكيلي يسر مرتضى فرج الحلو جعفر محمد جاسم

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الخلاصة

أجريت هذه الدراسة في الحقل الحيواني التابع لكلية الزراعة / جامعة البصرة للفترة من 2012/12/2 ولغاية 2013/3/2. شملت الدراسة 24 نعجة عرابية حلوب تراوحت أعمارها بين 2ــ 4 سنوات فردية الولادة ومتقاربة في أوقات ولاداتها ، متوسط أوزانها 42 كغم. وبعد أعطاء النعاج فترة تمهيدية لمدة 10 ايام ، وزعت النعاج عشوائياً الى ستة مجاميع (تغذوية) بالتساوي كل مجموعة أربعة مكررات. المجموعة الاولى غذيت على60% مركز و40% خشن فول صويا معاملة الفورمالديهايد، والثانية غذيت على60% مركز و40% خشن فول صويا غيرمعاملة الفورمالديهايد، والثالثة غذيت على50% مركز و50%خشن فول صويا معاملة بالفورمالديهايد، والرابعة غذيت على50%مركز و50%خشن فول صويا غيرمعاملة بالفورمالديهايد، والخامسة غذيت على40%مركز و60%خشن فول صويا معاملة بالفورمالديهايد، والسادسة غذيت على40%مركز و60%خشن فول صويا غيرمعاملة بالفورمالديهايد(السيطرة). وقدمت العليقة للنعاج على أساس 4% من وزن الجسم . وكانت العليقة المركزة مكونة من شعير 40% و ذره صفراء 20% و نخالة حنطة 30% و كسبة فول الصويا 7% و ملح الطعام 1% و حجر الكلس 2% . أما العلف الخشن يتكون من التبن تم معاملته باليوريا تركيز4% مع أضافة خميرة الخبز بمعدل 3كغم /طن. وتم معاملة كسبة فول الصويا بالفورمالديهايد والتي تعطي نسبة البروتين غير المتحلل الى البروتين المتحلل بالكرش من 30:70 (غير معامل) الى 40:60 (معامل بالفورمالديهايد) وبينت عدم وجود أختلافات معنوية بين المعاملات في الأس الهيدروجيني والبكتيريا الكلية والبكتيريا المحلله للسيليسلوز قبل الأكل . في حين كان هناك فروق معنوية ($P < 0.05$) لنفس المعايير بعد الأكل أذ سجلت المعاملة الثالثة أعلى قيمة للأس الهيدروجيني (6,82) وأعلى عدد للبكتيريا المحللة للسيليلوز ($8,7 \times 10^6$). وأظهرت المعاملتين الخامسة والسادسة تفوقاً معنوياً في أعداد البكتيريا الكلية مقارنة مع باقي المعاملات ($11,37 \times 10^7$) و ($11,86 \times 10^7$) على التوالي.تأثـر حامـض البروبيـونك ونسبـة حامض الأستيـت الـى حامض البروبيـونك معنويـاً($P < 0.05$)

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بأختلاف العلائق المقدمة للنعاج اذ تفوقت المعاملات الأربعة الأولى على المعاملتين الخامسة السادسة.