Tikrit Journal for Agricultural Sciences (2021) 21 (1):1-7
https://doi.org/10.25130/tjas.21.1.1

IRAQI Academic Scientific Journals
العراقية المجلات الأكاديمية العلمية

ISSN:1813-1646 (Print); 2664-0597 (Online)
Tikrit Journal for Agricultural Sciences
Journal Homepage: http:// www.tjas.org
E-mail: tjas@tu.edu.iq

TJAS
Tikrit Journal for Agricultural Sciences

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KEY WORDS:

Sheep ,Yeast, Digestibility, rumen pH, blood parameters.

ARTICLE HISTORY:

Received: 29/10/2020

Accepted: 16/12/2020

Available online: 31/03/2021

Effect of adding dry bread yeast *Saccharomyces cerevisiae* on nutrient digestibility, pH and some blood Characteristics in Awassi rams

ABSTRACT

The aim of the study was to find out the effect of adding several levels of yeast on digestibility of nutrients, some characteristics of rumen fluid and a number of blood parameters. It was achieved in the animal house of the College of Veterinary Medicine / University of Tikrit from 15/7/2017 until 01/10/2017. 16 Awassi rams were used with (36±0.34 kg) initial weight, and (10-12 months) of age. The animals were distributed into four experimental groups (4 lambs per group), and fed on four diets to which the yeast was added. The diets were included in the second groups T2, the third T3 and the fourth T4 on the yeast at rates of 3 g, 5 g and 7 g head /day respectively. It was provided with wheat hay as roughage feed in libtum form, and concentrated feed at a rate of 2.5% of the live weight measured weekly for a period of 75 days. The digestibility of organic matter increased with an upturn in the percentage of yeast in the diet (56.022, 60.529, 64.402 and 63.843), as well as the fiber digestibility factor (59.461, 62.325, 68.568 and 67.413). While the protein digestibility index decreased in T2 and T3 compared with the control group (56.403, 64.955, and 68.853 respectively) while the differences were not significant for the digestibility of dry matter and fatty matter. Rumen pH was increased to 9.675 after hours after eating the feed for the group that added 5 g / day of yeast to its diets. As for the blood parameters, the protein level decreased to 4.825 mg / 100 ml blood for the group that added 5 g / day. A day of yeast to its diet, compared to the control group, which was 5.550 mg / 100 ml of blood.

INTRODUCTION

Yeasts have been used in animal nutrition since ancient times, either as a byproduct of the fermentation process or the commercial production of yeast for the purpose of feeding the animal, such as sing cell protein, or as a biological booster (Ojokoh and Uzeh, 2005). Nutritional yeast cultures have been used for improving rumen fermentation on a large scale since the 1950s by researchers Beeson and Berry (Masek *et al.* 2008). The yeast has multiple benefits in feeding ruminants, as it has led to an increase in nutrient digestibility and improved intake (Marghany *et al.*. 2005) and a change in some blood parameters when adding yeast in specific proportions to the diets (Yalcin *et al.* 2011). Products containing *Saccharomyces cerevisiae* differ greatly in efficacy, mainly due to differences in the strain and viability of cells present in the yeast. Data indicate that yeast supplementation in the ruminant diet may improve feed intake (Robinson and Garrett, 1999), weight gain (Salama *et al.* 2002), digestion (Jouany *et al.* 1998), and rumen pH value (Doreau and Jouany, 1998) or Even providing the animal with unknown growth factors (Girard and Dawson,

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1995) , it lead to improving the rumen environment and improving digestive and immune activities (Abu-Salwa, 2016) .

Addition of yeast *S. cerevisiae* can improve fermentation efficiency, increase propionate production and reduce the acetate-to-propionate ratio. Moreover, it leads to the highest improvement in rumen fermentation efficiency and nutrient digestion in cattle (Khampa, 2009). In study that conducted by Al-Galbi *et al.* (2017) it indicated that giving yeast to lambs led to an improvement in the biochemical parameters of the blood serum, which reflects the improvement of their health status, which reduces the chances of infection, reduces the costs of veterinary treatments, and improves the performance of the animals.

Therefore, the objective of this study was to find out the effects of adding different concentrations of yeast on nutrient digestibility, rumen pH and some blood parameters in adult Awassi rams.

Material and Methods

The study was conducted in the animal house within the College of Veterinary Medicine / University of Tikrit from 15/7/2017 until 1/10/2017. 16 Awassi rams were used with (36±0.34 kg) initial weight, and (10-12 months) of age. To four equal groups of 4 lambs per group, as show in Table (1).

Table (1) Distributing of treatment in Experiment

Yeast% (gm/ day)	Treatment	None
0%	T1 (control)	Control
3%	T2	Second treatment
5%	T3	Third treatment
7%	T4	Forth treatment

The lambs were distributed randomly into single cages with dimensions of 1.25 x1.75 m, where each cage contained two feeders , the first feeder for the concentrate fed and the other feeder for roughage fed (wheat hay), in addition to containing a water receptacle , with the suspension of a metal salt block . The lambs of this study underwent a preparatory period of two weeks in order to accustom the lambs to the place and the fodder, and after the end of this period, the quantities of feed consumed were calculated and samples were taken.

Roughage feed was provided ad libtum , while the concentrated feed (that referred in table 2) was provided at a rate of 2.5% of the weekly live weight of the body, with two meals , morning and evening, and the study lasted 75 days. The components of the diet were analyzed as stated by Al-Khawaja *et al*, (1978) .

All lambs were underwent the veterinary program in the animal house, which included vaccination against both foot and mouth disease and intestinal poisoning, and vaccination against pulmonary, tapeworm and hepatic worms, as well as injection of ectoparasites with Ivermectin and 2cc subcutaneous

Table (2) Ratios and contents of ration

Ration contents	Ratio
Black barley	60
wheat grain	30
Soya bean meal	8
Limestone	1
Salt	1
Total	100
Crude protein	14.79
Metabolic Energy (Kcal/Kg)	2572

Measurement of digestibility: The animals were placed for a period of 10 days as a preparatory period, after which they were transported into digestion cages, whose dimensions were (1.2 x 0.6 m), which were designed for the purpose of collecting excreta and urine individually for each of them, and each cage was equipped with a feeder and receptacle for water. The animals were kept in the cages for 7 days, and every day the diet consumed by the animal was weighed and the excreted waste was weighed. The digestibility factor was measured for the components of the food as follows:

Digestion coefficent of Nutrition $\frac{\text{nutrient consumed} - \text{nutrient in faeces}}{\text{nutrient consumed}}$ x 100 (McDonald *et al*, 2010)

Blood tests: After the end of the experiment, 10 ml of blood was drawn from each animal from the jugular vein (Jain, 1986), after which the samples were left for 20 minutes for clotting and then they were kept on 4 ° C for 24 hours , then the serum was taken using a centrifuge (3000 revolutions / minute) and the samples were kept at (-20 ° C) until the analyzes were carried out. Blood characteristics were measured using a ready-made kit dedicated to each of the studied blood characteristics.

Statistical analysis: The equation for the mathematical model was as follows:

Yijk = μ + Pi + eijk

The results were statistically analyzed by applying the statistical analysis system (SAS, 2001) using complete random design (CRD). and the significance was tested using the modified Duncan's multiple range test (Duncan, 1955).

Results

The results that presented in Table (3) that in spite of the differences were not significant among the digestion parameters for the dry matter. The difference was evident with regard to the organic matter ingested, it was observed that the digestion parameters increased significantly ($p \leq 0.05$) in conjunction with the increase in the amount of added yeast. With diet 3 , 5 and 7g/ day (60.5296 , 64.4028 and 63.8432gm\L\day respectively compared with control (56.022 gm\L\day). As for the protein hum factor, a significant decrease was observed for the animals that consumed a diet plus 5 g / day of yeast, as it reached 56,403 g/day of yeast and then it decreased to 64.955 g/day of yeast for the animals that consumed the diet plus 7 g/day of yeast, while the control group reached 68,853 g/day of yeast. On the other hand, no significant differences were observed between the experimental animals in the treatments for digesting fats, while it was significant in the

treatments for digesting fibers, as the treatments increased significantly in conjunction with the increase in the amount of yeast that was added to the diet 3 and 5 g / day 62,325 and 68,568 respectively compared to the control group (59,461 g/day).

Table (3) Estimates of Digestibility

Items	Control	3 gm/day	5 gm/day	7 gm/day
Dry m.	79.288±1.017 A	79.203±2.667 A	72.430±3.253 A	77.153±0.632 A
Organic m.	56.022±0.547 C	60.5296±0.567 B	64.4028±0.383 A	63.8432±0.353 A
Protein D.	68.853±1.529 A	68.210±4.024 A	56.403±3.989 B	64.955±0.955 AB
Fat D.	82.178±0.874 A	81.998±2.298 A	77.870±3.131 A	83.033±0.358 A
Fiber D.	59.461±0.602 C	62.325±0.443 B	68.568±0.742 A	67.413±0.256 A

Note : Different letters within column indicating of significant differences ($p \leq 0.05$)

After observing Table (4), it appears that there are no significant differences between the treatments in the pH of a rumen liquid before eating the feed, and also after two hours of eating of the feed, while significant differences appeared between the averages after (4) hours of eating , as it increased In the second treatment, it equals 9,675, while it decreased to 8,550 in the control group, as well as in the first and third treatments, equals 7,050 and 7,850 respectively.

Table (4) Estimates of Rumen pH

Items	Control	3 gm/day	5 gm/day	7 gm/day
Pro	9.925±0.317 A	9.275±0.295 A	10.100±0.286 A	10.050±0.437 A
After 2 h.	8.850±0.202 A	8.850±0.193 A	8.850±0.194 A	8.600±0.041 A
After 4 h.	8.550±0.065 B	7.050±0.194 C	9.675±0.103 A	7.850±0.507 BC

Note : Different letters within column indicating of significant differences ($p \leq 0.05$)

As for the blood parameters, the protein level decreased to 4.825 mg\ 100 ml blood in the fourth treatment compared to the control group, which amounted to 5,550 mg\ 100 ml blood and the third treatment, which amounted to 5,700 mg /100 ml blood, as shown in Table (5). As for the triglycerides The three treatments were noticed, and there were no mathematical differences between the T2, T3 and T4 compared with control group, as the third treatment was 51,000 mg\ 100 ml blood compared to the control group 44,500 mg\ 100 ml blood and each of the second and forth treatments were 48.500 and 44,750 mg/ 100 ml blood, respectively. On the other hand, the treatments glucose, triglycerides, cholesterol, urea and albumin the differences were noticed did not reach to the level of significance.

Table (5) Estimates of Blood Characters

Items	Control	3 gm/day	5 gm/day	7 gm/day
Protein	5.550±0.171 A	5.150±0.150 AB	5.700±0.108 A	4.825±0.253 B
Glucose	35.250±1.109 A	32.750±0.479 A	35.250±1.377 A	33.500±2.661 A
Triglycerides	44.500±5.315 A	48.500±1.323 A	51.000±3.136 A	44.750±3.521 A
Cholest.	64.250±1.652 A	61.000±1.780 A	64.500±0.866 A	58.000±5.874 A
Urea	41.250±1.931 A	39.500±1.936 A	39.000±1.080 A	39.500±2.398 A
Albumin	7.9250±0.155 A	7.925±0.075 A	7.8750±0.048 A	7.375±0.284 A

Note : Different letters within column indicating of significant differences ($p \leq 0.05$)

Discussion

Digestion factor: The treatments didn't differ in the digestibility of dry matter, and this may be evidence that they consumed close quantities of the daily ration, and that the addition of yeast didn't affect the palatability of the consumed feed, but the effect of adding yeast led to a noticeable improvement in the fiber digestibility, and it may be This caused an increase in the number of fiber-degrading bacteria when fed yeast to animals (Rejab *et al.* 2013). And increase the proportion of consumed feed Compared with roughage that also shown in a table (2), Thus, the percentage of lignin decreased, and that improvement was reflected positively on the digestibility factor of organic matter, while there was a decrease in the protein digestibility, which may be due to the type of yeast used in the study in addition to the decrease in the activity of proteolytic bacteria (Mohammed, 2016 and Marghany *et al*, 2005) In addition to the quality of the feed materials consumed by the animals (Altayeb, 2019). The use of concentrated diets leads to an increase in the concentration of propionic acid and a decrease in the pH of the rumen after eating the feed (Mohammed and Saeed, (2019) and Kamra *et al.* 2002), The reason may also be due to the effect of the bread yeast, which is determined to reduce the pH of the rumen, to the decrease in the concentration of lactic acid in the rumen (Nocek and Kautz, 2006). Ondarza *et al.* (2010) explained that the mechanism of yeast action in rumen metabolism is the stability of rumen pH by maintaining the reduction effort, increasing the number of microbial populations that decompose cellulose and increasing the digestion of fiber accordingly, and using starch and sugars to reduce the rate of lactic acid production and avoid the acidity of rumen and liberate vitamins and factors.

Blood characteristics: It appears from Table (2) that the diet that the experimental animals consumed is one, but the treatments differed in the added amount of bread yeast, in other words, the animals consumed the same amount of fat in the diet, and this may be the reason for the lack of difference in the level of glucose as well as the level of triglycerides in the blood, and accordingly, the effect of yeast is consistent with the study that conducted by Stanislaw and Sobiech, (2009) and Altayeb, (2019). The level of total protein in blood, was decreased significantly in the treatment that consumed a diet plus 7 g/ day of yeast, and this may be due to the decrease in protein digestion as noted in Table (3), which led to a decrease in the proliferation of bacteria that make up the cellular protein. Thus, it contributes to a decrease in total blood protein. **(**Chiofalo *et al.* 2004).

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تأثير اضافة خميرة الخبز الجافة Saccharomyces cerevisiae على معامل هضم العناصر الغذائية والاس الهيدروجيني وبعض معايير الدم للكباش العواسية

موفق حسين الجميلي

فرع الصحة العامة – كلية الطب البيطري – جامعة تكريت – تكريت – العراق

الملخص

استهدفت هذه الدراسة تأثير اضافة عدة مستويات من خميرة الخبز الجافة على معامل هضم العناصر الغذائية والاس الهيدروجيني لسائل الكرش وبعض صفات الدم الكيموحيوية . واجريت تلك الدراسة في البيت الحيواني التابع لكلية الطب البيطري/ جامعة تكريت. واستخدمت فيها (16) كبشاً عواسياً اعمارها (10-12 شهراً) واوزانها (36 ± 0.34 كغم). وزعت الحيوانات الى اربع مجاميع تجريبية (4 حملان لكل مجموعة) ، وغذيت على اربع علائق اضيفت اليها الخميرة وتضمنت العلائق في المجموعات الثانية T2 والثالثة T3 والرابعة T4 على الخميرة بنسب 3غم و 5غم و 7 غم رأس/يوم على التوالي. قدم لها تبن الحنطة كعلف خشن بصورة حرة فضلاً عن العلف المركز بنسبة 2.5% من الوزن الحي المقاس اسبوعياً ولمدة 75 يوماً. ازداد معامل هضم المادة العضوية مع زيادة نسبة الخميرة في العليقة (56.022 ، 60.529 ، 64.402 و 63.843) ، وكذلك معامل هضم الالياف (59.461 ، 62.325 ، 68.568 و 67.413) . بينما انخفض معامل هضم البروتين في T2 و T3 مقارنة مع مجموعة السيطرة (56.403 ، 64.955 ، 68.853 على التوالي) بينما كانت الفروقات غيرة معنوية لمعاملات هضم كل من المادة الجافة والمادة الدهنية. ارتفع اللاس الهيدروجيني للكرش الى 9.675 بعد مرور (4) ساعات من تناول العلف للمجموعة التي اضيف 5 غم/يوم من الخميرة الى علائقها ، اما بالنسبة لمعايير الدم فقد انخفض مستوى البروتين الى 4.825 ملغم/100مل دم للمجموعة التي اضيف 5 غم/يوم من الخميرة الى علائقها ، مقارنةً بمجموعة السيطرة والتي بلغت 5.550 ملغم/100مل دم.

الكلمات المفتاحية : اغنام ، خميرة ، معامل الهضم ، الاس الهيدروجيني للكرش ، معايير الدم