

**EFFECT OF *SACCHAROMYCES CEREVISIAE* ON THE
CHARACTERISTICS OF RUMEN FLUID AND SOME OF BLOOD
VARIABLES IN ADULT AWASSI LAMLS**

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ABSTRACT

This study was aimed to investigate the effects of adding different concentrations of yeast on some of rumen fluid traits and some blood characteristics in adult Awassi lambs. The study was conducted in the animal house at the College of Veterinary Medicine/University of Tikrit for the period from 15/7/2017 to 1/10/2017, using 16 Awassi lambs, aged (10 – 12 months), and an average weight of (36 kg)., The animals were divided into four groups, each one included four lambs. The first group was considered as control (T1), without the addition of bread yeast to their foods. The diets in the other groups, (T2), (T3) and (T4) contained the yeast in the proportions of 3, 5 and 7 gm/ animal / days, respectively. Wheat straw was introduced as a free coarse feed as well as concentrated feed at 2.5% of weight, which is measured weekly for 75 days. The study showed no significant differences in the concentration of ammonia, volatile fatty acids and pH, measured after 1 and 3 hours with feed. While the pH was significant ($P \leq 0.05$) immediately after feeding, no significant differences were found in all studied blood characteristics except, which are the levels of cholesterol and total protein, which was differ significantly ($P \leq 0.05$).

Key words: sheep, yeast, rumen fluid, blood parameters.

شهاب وآخرون

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تأثير خميرة *Saccharomyces cerevisiae* على صفات سائل الكرش وعدد من معايير الدم للحملان العواسية البالغة

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المستخلص:

اجريت الدراسة في البيت الحيواني العائد الى كلية الطب البيطري/ جامعة تكريت للفترة من 15/7/2017 ولغاية 1/10/2017، باستخدام 16 حملا عواسياً بعمر 10-12 شهراً وبمعدل وزن ابتدائي 36 كغم، قسمت الحملان الى اربعة مجاميع متساوية بالعدد ومتقاربة بالوزن (4 حملان لكل مجموعة) واعتبرت المجموعة الاولى السيطرة T1 وبدون اضافة خميرة الخبز، وتضمنت العلائق في المجموعات الثانية T2 والثالثة T3 والرابعة T4 على الخميرة بنسب 3غم و 5غم و 7غم رأس/يوم على التوالي. قدم لها تبين الحنطة كعلف خشن بصورة حرة فضلاً عن العلف المركز بنسبة 2.5% من الوزن الحي المقاس اسبوعياً ولمدة 75 يوماً، كان الهدف من الدراسة هو معرفة تأثير اضافة عدة مستويات من الخميرة على بعض صفات سائل الكرش وعدد من معايير الدم. بينت الدراسة عدم وجود اي فروق معنوية في تركيز الامونيا والاحماض الدهنية الطيارة ودرجة الاس الهيدروجيني المقاسة بعد 1 و 3 ساعات مع تقديم العلف، في حين كانت درجة الاس الهيدروجيني معنوية ($P \leq 0.05$) بعد تقديم العلف مباشرة، كذلك لم يظهر وجود اي فروق معنوية في صفات الدم المدروسة جميعها عدا مستوى المعنوية ($P \leq 0.05$) في مستوى الكولسترول والاليومين.

الكلمات المفتاحية: اغنام، خميرة، سائل الكرش، معايير الدم

INTRODUCTION

In the past few years, the idea of using probiotic enhancers such as dry bread yeast, as feed additives in animal feed in order to increase their meat and milk production, and matchmaking the requirements of the rapidly growing world population (1). The yeast *Saccharomyces cerevisiae* is the type of yeast widely used in various fields, including the making of bread. The Taxonomy of this yeast as follow: class; Ascomycete, order Endomycetales, Family Saccharomycetaceae, genus *Saccharomyces* and the species; *Cerevisiae* (2). The addition of this type of yeast to the diets will increase the effectiveness of the cellulose-decomposing bacteria. This process requires anaerobic conditions (16), as well as sustaining the vitality of these colonies, and thus creating a microbial balance resulting from consumption of ammonia concentrations produced in the rumen (4) and (7). the yeast is a biological factor that helps increase the production of active substances in plants as a result of metabolism processes (19). A significant change in the concentration of volatile fatty acids (VFA) was observed by (8). The effect of added yeast has also been reflected on many blood parameters such as total protein, cholesterol, albumin, and glucose (20). The aim of this study was to investigate the effects of adding different concentrations of yeast on some of rumen fluid traits and some blood characteristics in adult Awassi lambs.

MATERIALS AND METHODS

The study was conducted at the animal house, College of Veterinary Medicine/ Tikrit University for the period of 15/7/2017 until 1/10/2017. 16 Awassi lambs were used, aged between 10 - 12 months, with an average weight of 36 ± 0.34 kg, divided into four groups of four lambs per group, as shows in Table 1.

Table 1. Distribution of the groups according to concentration of yeast

Groups	Name of treatment	Concentration of yeast (gm./animal/day)
Control	T1(control)	0
(Yeast 3%)	T2	3
(Yeast 5%)	T3	5
(Yeast 8%)	T4	7

The lambs were randomly distributed on

individual cages with dimensions of (1.25 x1.75mm). Each cage contained two types of feeds. The first types for concentrated feed and the second one is coarse feed (wheat hay), as well as a water manhole, with a metal salt block. The lambs underwent a two-week introductory period, in order to accustom to the place and fodder. The coarse feed was provided as free feeding, while the concentrated feed was provided at 2.5% of the weekly live body weight for two times, at morning and at evening for the duration of the study (75 days). All lambs underwent veterinary program in the animal house, which included vaccination against foot and mouth disease, intestinal poisoning, drug dosing against pulmonary, tapeworm and hepatic worms, as well as ivermectin injections against external parasites with 2 ml subcutaneously. The animals were fed on roughage ad-lip, while concentrated feed was provided at 2.5% of the live body weight with two rations in the morning and evening, and the study lasted 75 days. Table 2 refer the component of ration.

Table 2. Ratio and Composition of the diet

Compositions	Ratio%
Black barley	60
Wheat bran	30
Soybean meal	8
Vitamins and minerals	1
Total	100
crude protein	14.79
Metabolized energy Kcal / Kg	2572

Rumen fluid samples

Rumen fluid samples were first withdrawn at specific intervals (before feeding, and 1 to 3 hours after feeding). The samples were collected by stomach tube through the mouth, then the fluid was filter by gauze and directly the pH was recorded using pH meter, the samples were then filled as follows:

- 1- Transfer 20 ml of the sample in a package and add 1 ml of HCl for the purpose of estimating ammonia concentration.
- 2- Transfer 25 ml for the purpose of estimating volatile fatty acids VFA.

Estimation of ammonia

Ammonia was estimated in rumen liquid according to (3) as follows:

- 1- 0.05 ml (50µl) of sample or standard added in a test tube (50µl water of plank)
- 2- Mixed with 2.5 ml of phenol solution.
- 3- 2 ml of Hypochlorite solution added and

mixed.

4- Left in a water bath at 95° for 5 minutes.

5- After cooling, the samples were read by the spectrophotometer at wavelength (630 nm).

Determination of volatile fatty acids

10 ml of rumen fluid was taken and 5 ml of oxalic acid (5%) and 5 ml of potassium oxalate (10%) were added. A small amount of water was added and 75 ml of the mixture liquid was loaded into a distillation unit. Then, a few drops of the phenolphthalein index were added, and the solution distilled. After receiving 75 ml of the liquid, it was titrated with 1% sodium hydroxide (9).

Volatile fatty acids are estimated as follows:

Total volatile fatty acids = volume of NaOH × 10

Blood tests After the end of the experiment, (10 ml) of blood was withdrawn from each animal from the jugular vein. The samples then were left for 20 minutes to be coagulated and kept in the refrigerator at 4°C for 24 hours. The serum then was isolated using a centrifuge (3000 cycles/min). Samples were kept at a temperature of -20°C until analysis were carried out. Blood characteristics were

measured using the kit prepared for each test.

Statistical analysis

Statistical analysis of the data were carried out using the SAS statistical analysis system (17) and the significance was tested using the Duncan's multiple range test (6).

RESULTS AND DISCUSSION

The data in table (3) showed that there was a significant increase ($P \leq 0.05$) in the pH value of the rumen liquid before the feed intake. The pH value before feed intake was (5.78) for treatment (T2), followed by (T3) and T4 with values of (5.48) and (5.45), respectively. Comparing the aforementioned values with the control group (T1), which was (5.10) and after feeding, no significant differences were observed between treatments. This result confirms with what was noted by Dawson (2000), that the goal of adding the yeast to ruminant diets is to improve the rumen environment and make it basic. This treatment has increased the effectiveness and activity of the bacterial colonies for digesting cellulose (4).

Table 3. Effects of treatments on some characteristics of rumen fluid (Mean ± Standard Error).

Characteristics	NH ₃	VFA	pH pro	PH 1h	PH 3h
T1(Control)	18.75 ± 0.75	2.88 ± 0.32	5.10 ± 0.17 ^b	5.68 ± 0.23	5.65 ± 0.17
T2	19.75 ± 0.75	2.35 ± 0.12	5.78 ± 0.18 ^a	5.98 ± 0.30	5.35 ± 0.10
T3	16.00 ± 1.68	2.63 ± 0.24	5.48 ± 0.21 ^{ab}	5.88 ± 0.42	5.58 ± 0.10
T4	18.00 ± 1.47	2.88 ± 0.13	5.45 ± 0.07 ^{ab}	5.55 ± 0.09	5.70 ± 0.11

* Different letters within one column indicate significant differences ($P \leq 0.05$)

For the biochemical characteristics of the blood, table (4) showed that the addition of the yeast to the adult lamb diets affect significantly ($P \leq 0.05$) on cholesterol level, and showed a significant decrease ($P \leq 0.05$) in the level of total protein in the blood. The study revealed no significant difference for the rest of the studied characteristics according to the different treatments. On the other hand, cholesterol level decreases in animals with a diet of yeast supplemented by 7 g/animal/day, reaching 58 mg/100 ml of blood, and it was 61 mg/100 ml of blood for diets contained 3 g/day of yeast. In addition, the highest cholesterol levels in the first and third groups were 64.25 and 64.50 mg/100 ml of blood, respectively. This level of treatment decreased by 7 gm. of yeast, according to (14). This may be due to

the effect of yeast on the process of synthesis. The level of total protein in blood was decreased significantly ($P \leq 0.05$) in animals with a diet has addition of the yeast by 7g/ day at 7.88g/100 ml of blood, whereas the highest level of total protein in the second group was 3g/ day, followed by the control group 93g/ 100 ml. The result is similar to that reported by (14), in terms of significant effect during its study on Awassi sheep, added to their diet of commercial bread the yeast *saccharomyces cerevisiae*. (20) was found no significant decrease in protein level when the yeast (2.5 and 5g) was added to the lamb diets. *Masek et al.* (12) did not notice any significant effect of the yeast on the blood parameters under study when the yeast was added at (3 and 6g) to ewe diets.

Table 4. Effects of treatments on some blood biochemical characteristics (Mean ±Standard Error)

Variables	Glucose mg / 100 ml	Triglyceride mg / 100 ml	Cholesterol mg / 100 ml	B. Urea mg / 100 ml	Albumin mg / 100 ml	Total Protein mg / 100 ml
T1 (Control)	35.00 ± 1.68	51.75 ± 2.69	64.25 ± 2.78 A	41.25 ± 1.91	5.33 ± 0.19	7.93 ± 0.16 a
T2	32.75 ± 1.65	48.50 ± 1.32	61.00 ± 1.78 ab	39.50 ± 2.33	5.42 ± 0.18	7.93 ± 0.08 a
T3	35.25 ± 1.38	51.00 ± 3.14	64.50 ± 0.87 A	39.00 ± 1.02	5.30 ± 0.11	7.88 ± 0.05 ab
T4	31.50 ± 1.76	44.75 ± 1.80	58.00 ± 2.12 B	39.50 ± 2.40	5.50 ± 0.21	7.38 ± 0.28 b

Different letters within one column indicate significant differences ($P \leq 0.05$)

The high acidity of the rumen fluid causes a decrease in the number of microorganisms, including cellulose analyzer. The number of microorganisms is very sensitive to the decrease in its pH (11) and as a result, the feed consumption is reduced and there may be disturbances in the rumen action (18). It was noted a significant increase in the level of blood cholesterol in the control group and a significant decrease when adding yeast at levels 3 and 7gm. This notice could be an indication of increased liver activity in converting cholesterol into bile acids. On other hand, the total cholesterol level in blood depends on age, physiological state and diet, particularly on the total lipid and long-chain fatty acid content in the ration (15), which is construe the effect of yeast on physiological state of lambs. The decrease in the total protein level after adding yeast, indicates an increase in protein metabolism in tissues, especially muscles, which gives a positive indication of increased feed intake and growth. Some studies reported that yeast supplements caused significant changes in the microbial flora in rumen, by lowering protozoon counts and increasing the size of bacterial populations responsible for the course of ruminal processes. The above inhibits the degradation of bacterial and feed protein and enhanced its flow to the distal segments of the digestive tract. Hence, leading to a significant increase in the body weight gains of calves (13). In addition, other results were recorded in an experiment was conducted on lambs fed the Inter Yeast feed supplement containing *Saccharomyces cerevisiae* (10).

CONCLUSIONS

Culture yeast declined the pH of the rumen

liquid before the feed intake. On the other hand, biochemical characteristics of the blood showed that the addition of yeast to the adult lamb diets decreased both the cholesterol level and the level of total protein in the blood. This may attributed to the effect of yeast on the process of synthesis. The level of total protein in blood was decreased with a diet having addition of the yeast by 7.gm. However, further studies require screening of more numbers of yeast strains for their suitability to develop a promising microbial additive.

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