EFFECT OF YEAST AS A PROBIOTIC ON GROWTH PERFORMANCE AND SOME PHYSIOLOGICAL PARAMETERS IN OSSIMI LAMBS

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ABSTRACT

This research aimed to evaluate the effect of supplementation *Saccharomyces cerevisia* (SC) yeast on growth performance and some physiological parameters in Ossimi lambs.

Twenty lambs were assigned randomly to four groups of 5 animal each. Lambs of the first group (G1) were given a basal ration (control), the second group (G2); the third group (G3) and the fourth group (G4) were given SC-5g; SC-10g and SC-15g/head of yeast, respectively plus basal ration.

The effect of SC yeast treatments was significant ($P \leq 0.05$ or $P \leq 0.01$) on body weight (BW), daily gain (DG) and dressing percentage (DP) at different ages. On the other hand, the effect of supplemented SC yeast was not significant ($P>0.05$) on feed intake .

No significant effect of SC yeast was found on rectum temperature, respiration rate and blood parameters (total protein, albumin, globulin, urea and creatinine)

Highly positive correlation between SC-yeast treatments and both of body weights and dressing percentage were found, it was ranged from 0.72 to 0.86. The highest value was 0.86 between SC-yeast treatments and dressing percentage and the lowest value was 0.72 between SC-yeast treatments and body weight at 180 days of age and the other values for correlation came in between. On the other hand, there was a negative or low correlation values between SC-yeast treatments and feed intake at different ages.

In Conclusion, using SC yeast proved to be a profitable natural solution to enhance growth performance of growing lambs. This may be due to its ability to help establish a good rumen microflora from that start and its proven effect on feed utilization.

Key words: Yeast, Daily gain, Albumin, Globulin, Urea and Feed intake.

INTRODUCTION

Sheep are known for their good ability to utilise organic feed; therefore, attempts are made to supplement animal diets with feed additives stimulating lambs growth and ewe productivity through increasing milk yield to ensure adequate lamb-rearing conditions. One such natural stimulator, with probiotic and prebiotic properties is *Saccharomyces cerevisiae* yeast, which has a wide used in ruminant.

The supplementation of animal feed with yeast can, therefore, have a varied effect, but it usually enhances animal productivity. *Saccharomyces cerevisiae* yeast is a rich source of valuable protein, vitamin B complex, numerous minerals and enzymes, as well as immunomodulators: β-1, 3/1, 6-D-glucan (up to 15%) and Mannan-Oligo Saccharides - MOS (up to 11%),

Milewski, *et al* (2007) their findings support yeast use in lamb nutrition. **Erasmus *et.al.* (1992)** in a study of suckling lambs, the author noted that the administration of Inter Yeast mixed with concentrate stimulated the growth rate and muscle development in lambs.

The *Saccharomyces cerevisiae*, facultative anaerobic yeast, exhibits some degree of rumen viability and can influence fermentation and populations of rumen microbes. Addition of *Saccharomyces cerevisiae* live yeast cultures to ruminant diets has improved fibre digestibility and stimulated cellulolytic bacteria and rumen fermentation **(Garcia *et al*, 2000).** Yeast cultures have been dietary administrated to ruminants with varied responses. They affected ruminal pH **(Rossi *et al*, 1995)** and protozoa count **(Garcia *et al*, 2000),** but in other studies no changes in ruminal pH **(Marzouk *et al*, 2009),** ruminal protozoa **(Corona *et al*, 1999)** and blood **parameters (Erasmus *et al*, 1992)** were observed.

The aim of current research is to evaluate the effect of supplemental yeast (*Saccharomyces cerevisiae*) on growth performance and some physiological parameters in Ossimi lambs.

MATERIAL and METHODS

Management of lambs:

Twenty Ossimi lambs with average initial body weight of about 18.41 ± 0.65 Kg and aged four months, were randomly divided into 4 similar groups, each of 5 animals. Lambs of the 1st group were given a basal diet only and considered as the control group. The other groups received a basal diet plus supplemental SC yeast with 5g (SC-5), 10g (SC-10) and 15g (SC-15) per head per day for the 2nd, the 3rd and the 4th groups, respectively. Yeast was fed with concentrate mixture.

The basal diet used in this experiment consisted of roughage and Concentrate mixture in ratio of 30:70, respectively. All lambs of the four groups were fed to cover their nutrional requirements according to NRC, 1985. Egyptian clover (*Trifolume alexandrium*), besides the green maize (Darawa) and wheat straw were used as a roughage. The concentrate mixture contained 25% undecorticated cotton seed cake, 35% wheat bran, 34% corn, 3% molasses, 1.5% lime stone and 1.5% common salt.

Animals were from private farm in Zagazig and they were slaughtered for Greater Bairam feast , it was difficult to take any parts from carcass to weight or analysis, except carcass weight which used to obtain dressing percentage (DP) in the present study. Feed intake (FI) was recorded daily per each animal group. Animals body weight (BW) was recorded and BW1, BW2, BW3, BW4 were estimated at 120, 180, 240 and 300 day respectively, so daily gain was obtained (DG). Water intake was determined daily per each animal.

Rectal temperature and respiration rate were recorded daily at 9 a.m., the rectal temperature was measured by clinical thermometer. Respiration rate was determined at the same time by counting the flank movements using stop watch. Blood samples were collected in tubes without anticoagulant to obtain blood serum. Total protein and albumin (ng/DL) in serum were achieved by using test kits combination provided by diamond diagnostics according to **Cannon (1974) and Bengand Lim (1973),** respectively. While globulin was determined by subtraction the albumin from total protein. Colorimetric methods were used for the determination of serum urea and creatinine **(Varley, 1975).**

Statistical Analysis: Data were statistically analyzed according to the Analysis of Variance (ANOVA) and the differences among means were detected by Duncan's multiple range test (DMRT), according to SAS (2002), [13]. Model used to analyse the effect of supplemental SC yeast on growth performance and some physiological parameters in lambs was as follows:

$$\mathbf{Y_{ij} = \mu + T_i + e_{ij}}$$

where: $\mathbf{Y_{ij}}$ = The trait under study for $_{ij}^{th}$; $\boldsymbol{\mu}$ = general mean , common element to all observation; $\mathbf{T_i}$=The effect due to i^{th} treatment, (i= 1,2,3 and 4) where 1= control , 2=SC-5g , 3=SC-10g and 4=SC-15g; and $\mathbf{e_{ij}}$ = Random error associated with the individual observation.

Factor under investigation was assumed to be fixed and error term which was assumed to be random and normally distributed.

RESULTS and DISCUSSION

The effect of dietary levels of SC yeast on body weight, daily gain and feed intake are shown in Table (1).

The initial weight of all animal groups was not significant showing that all animals were nearly similar at the start of the experiment. The effect of *Saccharomyces cerevisiae* (SC) yeast treatments was significant ($p \leq 0.05$ or $p \leq 0.01$) on body weight (BW), daily Gain (DG) at different ages and dressing Percentage (DP) .

The positive relationship among levels of SC yeast and BW, DG and DP of lambs were observed. These traits increased with the increase in level of SC yeast. The control group had the lowest values, while the treated group with SC-15g yeast had the heighest values and the other treated groups with SC came in between. On the other hand, the SC yeast treatments had no significant effect on feed intake of lambs.

To understand the role of yeast in improve animal productivity , it is very important to know the mode of action of yeast probiotics, this effect can be explained at two levels firstly, at the rumen level, the increase micronutrient supply (increase lactate utilisers celluloytic bacteria (protozoa and fungi), polysaccharidases and rate of organic matter digestion. As well as, increase oxygen uptake which reduce redox potential **(Erasmus *et al*, 1992)**. Secondly, at the animal level, due to the increase in micronutrient supply in feed beside the incease in energy and amino acids. Also, the pH stabilization resulted in removal of toxicants (chemical and pathogens) and decrease risk of acidosis then decrease health disorders **(MacDonald *et al*, 2002). Moreover, Williams (1989)** reported that yeast cultures may provide factors which stimulate rumen cellulolytic and proteolytic bacteria especially when high concentrate (> 50%) diets are given.

Table (1): Means ± SE, level of significance and Duncan's method for the effect of yeast treatments on body weight, daily gain, feed intak, water intake and dressing%.

Item	Dietary levels of SC yeast				Level of Sig.
	Control	SC-5g.	SC-10g.	SC-15g.	
Body weight (BW),Kg.					
Initial wt(BW1)	18.26±0.45	18.12±0.79	18.04±0.96	18.74±0.47	NS
BW2	24.70±0.43 b	26.00±0.72 b	26.66±0.84 b	28.98±0.76 a	**
BW3	33.30±0.76 c	34.56±0.47 bc	35.94±1.08 b	39.22±0.84 a	**
Final wt(BW4).	39.48±1.98 c	44.14±0.59 b	47.08±1.65 ab	50.92±1.13 a	**
Daily Gain (DG),Kg.					
DG1	0.107±0.01 c	0.131±0.01 bc	0.144±0.01 b	0.171±0.01a	**
DG2	0.143±0.01 b	0.1b3±0.01 b	0.155±0.01 ab	0.171±0.01a	**
DG3	0.103±0.04 b	0.160±0.01 ab	0.186±0.01 a	0.195±0.01a	*
Total DG	0.118±0.01 c	0.145±0.01 b	0.161±0.01 ab	0.179±0.01a	**
Feed Intake (FI),gm.					
FI1	442.20±15.55	404.00+6.52	422.20+12.36	414.80+15.03	NS
FI2	666.00+16.72	672.40+6.30	668.0+16.44	666.00+16.72	NS
FI3	938.40+25.09	867.40+27.96	896.20+16.45	942.20+16.70	NS
Water Intake, ml.	2913.60±33.05a	2831.80±18.61ab	2784.60±23.85b	2766.60±34.46b	**
Dressing%	46.78±0.88 c	52.40±0.62 b	54.40±1.33 b	57.76±1.28 a	**

* Significant at level 5% ($p \leq 0.05$); ****** highly significant at level 1% ($p \leq 0.01$), and **NS** not significant. a, b, c means with the same letter are not significantly difference. BW2, BW3, BW4; DG1, DG2, DG; FI1, FI2, FI3 were at 180, 240 and 300 day, respectively. while BW 1 was at 120 day.

The effect of dietary levels of SC yeast on rectum temperature, respiration rate and blood parameters (total protein, Albumin, globulin, Urea and creatinine) are shown in Table (2).

Total protein and urea concentrations tended to increased insignificantly in serum of sheep received dietary supplemental yeast in comparison to control animals. However, albumin and globulin concentrations were nearly similar. Elevations of creatinine concentrations were observed in treated sheep but the variations were not statistically significant. **Iwanska *et al* (1999)** reported a trend for increasing blood total protein concentrations in cows received dietary supplemental yeast. They also observed simultaneous slight differences in blood urea nitrogen concentrations. **Abo El-nor and Kholiff (1998)** have evidenced significant elevations of blood serum total protein, albumin, and urea concentrations in lactating buffaloes supplemented with yeast.

The efficiency of feed nitrogen utilization in ruminants supplied with yeast culture involved not only ammonia incorporation into microbial protein and a higher flow and absorption of amino acids but also an altered endogenous nitrogen metabolism. The excess of rumen ammonia concentration, unutilized by rumen bacteria, may induce high endogenous concentrations of urea in blood **(Onifade, 1997). Roseler *et al*. (1993)**

suggested that blood urea nitrogen may serve as an indicator of ruminal protein degradability and post-ruminal protein supply. **Galip (2006)** reported that the supplemental yeast culture perhaps make the repartition of protozoa types in rumen, leading to positive effects on cellulose digestibility and on nitrogen incorporation in microbial proteins.

Table (2): Means ± SE of the effect of yeast treatments on Rectum Temperature, Respiration Rate and Blood Parameters.

Item	Dietary levels of SC yeast			
	Control	**SC-5g.**	**SC-10g.**	**SC-15g.**
Rectal Temperature (RT),c				
RT1	39.44±0.10	39.50±0.18	39.40±0.15	39.50±0.21
RT2	39.78±0.18	39.26±0.18	39.60±0.16	39.34±0.12
RT3	40.28±0.21	40.06±0.24	40.30±0.23	39.92±0.24
Respiration Rate (RR)				
RR1	73.20±1.80	77.80±1.85	71.00±2.77	77.80±2.63
RR2	76.20±2.35	76.20±2.35	73.60±2.11	77.80±1.98
RR3	78.00±2.22	80.20±2.22	77.80±1.46	79.80±1.69
Serum parameters				
T. Protein,g/dl	6.90±0.13	7.04+0.33	7.00+0.22	6.82+0.13
Albumin,g/dl	3.50+0.16	3.92+0.31	3.68+0.27	3.74+0.16
Globulin,g/dl	3.40+0.06	3.12+0.17	3.32+0.11	3.08+0.08
Urea,mg/dl	23.68±0.77	24.88±0.21	24.44±1.18	24.10±0.65
Creatinine,mg/dl	1.60±0.10	1.48±0.12	1.46±0.10	1.48±0.11

Averages of RT1, RT2, RT3 or RR1, RR2,RR3 were estimated at 180, 240 and 300 day, respectively.

The correlation Coefficient among SC-yeast treatments and growth performance and blood parameters is illustrate in Table 3.

Highly positive Correlation between SC-yeast treatments and both of body weights and dressing percentage was found, it was ranged from 0.72 to 0.86. The highest value was 0.86 between SC-yeast treatments and dressing percentage and the lowest value was between SC-yeast treatments and body weight at 180 day and the other values for correlation came in between. On the other hand, no correlation was found between SC-yeast treatments and feed intake at different ages.

Table (3): The correlation Coefficient among SC-yeast treatments and growth performance and serum parameters.

Items	Correlation Coefficient(r)
SC-yeast vs,	
Growth performance	
Body weight (BW):	
BW 1 (120d)	-
BW 2 (180d)	0.72**
BW 3 (240d)	0.75**
BW 4 (300d)	0.82**
Feed intake(FI)	
FI1 (180d)	-0.07 NS
FI2 (240d)	-0.07 NS
FI3 (300d)	0.08 NS
Dressing%	0.80**
Serum parameters	
Total protein	-0.07 NS
Albumin	0.11 NS
Globulin	-0.32 NS
Urea	0.05 NS
Creatinine	-0.19 NS

d,days of age;NS,not significant;**,highly significant

Results concerning total protein levels in experimental ewes confirm those reported by authors **Roseler *et al*. (1993) and Wallace (1994)** they demonstrated that neither live yeast cultures nor dried yeast had a significant effect on the total protein in ruminants. This indicates that the administered yeast supplement exerted a favourable influence on energy metabolism parameters. The decrease in urea and creatinine concentrations recorded in the study suggests that yeast had a protective effect on renal function. Most probably, β-glucans cause an increase in blood pressure, thus improving blood supply to parenchymatous organs. As regards polygastric animals, an insignificant decrease in creatinine content was observed in adult ewes and lambs fed diets supplemented with live yeast cultures **(Iwanskaet *et al*, 1999).**

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تأثير إضافة الخميرة كمنشط على أدء النمو و بعض المقاييس الفسيولوجية فى الحملان الأوسيمى

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هدف هذا البحث إلى دراسة تأثير الخميرة على أداء النمو وبعض القياسات الفسيولوجية فى الحملان حيث تم توزيع ٢٠ حمل عشوائيا على أربعة مجمايع (كل مجموعة بها خمسة حيوانات). تم إعطاء المجموعة الأولى (ج١) العليقة الأساسية (عليقة المقارنة) بينما تم إعطاء المجموعة الثانية (ج٢) ، المجموعة الثالثة (ج٣) والمجموعة الرابعة (ج٤) ٥، ١٠، ١٥جرام خميرة لكل رأس من الحملان على التوالى بالإضافة إلى العليقة الأساسية.

أوضحت النتائج أن تأثير إضافة الخميرة كان معنويا (على مستوى معنوية ٥% أو ١%) على كل من وزن الجسم و النمو اليومى ونسبة التصافى عند الأعمار المختلفة للحيوانات. على الجانب الأخر كان تأثير إضافة الخميرة غير معنوى على الغذاء المأكول وكذلك درجة حرارة المستقيم ومعدل التنفس وقياسات الدم (البروتين الكلى، الألبيومين، الجلوبيولين، اليوريا والكرياتينين).

كما وجد معامل إرتباط موجب عالى بين معاملات الخميرة و كلا من وزن الجسم و نسبة التصافى حيث تراوح بين ٠.٧٢ حتى ٠.٨٦ .حيث كان أعلى قيمة (٠.٨٦) بين معاملة الخميرة ونسبة التصافى وكانت أقل قيمة (٠.٧٢) بين المعاملة بالخميرة و وزن الجسم عند عمر ١٨٠ يوم على الجانب الأخر لم يوجد إرتباط بين المعاملة بالخميرة و الغذاء المأكول عند الأعمار المختلفة.

يستنتج من هذه الدراسة أن إضافة الخميرة تحسن أداء النمو للحملان النامية وربما يرجع ذلك إلى مقدرتها للمساعدة فى ثبات عشيرة ميكروبية جيدة فى الكرش وتحسين الأستفادة من الغذاء.