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Productive Performance of Barki Sheep Fed Rations Containing Rymi Yeast

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Abstract: Yeast products are widely utilized as feed additives for ruminant animals in Egypt and many parts of the world. So this work aimed to established the impact of adding Rumi yeast as feed additives in Barki sheep ration to study its effect on their productive performance, drinking water and economic efficiency. Twenty one of growing male Barki lambs aged 5-6 months with an average weights (27.200 ± 1.938 kg) were randomly divided into three equal groups and fed as group feeding for 84 days. The experimental rations were offered at 4% dry matter of live body weight, tested rations were divided in to 60% concentrate feed mixture (CFM) and 40% roughage (wheat straw). Rymi yeast (commercial product) was added to concentrate feed mixture (CFM) at 0, 1 and 2 grams per one kg CFM for R_1, R_2 and R_3, respectively. The results showed that increasing level of RY adding both total body weight gain and average daily gain were significantly ($P<0.05$) increased comparing to the control. All calculated feed conversion were insignificantly ($P>0.05$) improved. Relative economical efficiency was improved by 114.8 and 132.2% for R_2 and R_3, respectively when assuming that the relative economic efficiency of R_1 equals 100. Values of feed cost (LE/ kg gain) was decreased from 32.53 to 30.91 and 29.84 LE for R_1, R_2 and R_3, respectively. It can be concluded that adding Rumi yeast as feed additive in sheep ration realized an improving in their performance, relative economic efficiency and decreased feed cost/ kg gain.

Key words: Feed additive · Rymi yeast · Sheep · Performance · Water consumption · Economic efficiency

INTRODUCTION

For many years, ruminant nutritionists and microbiologists have been interested in manipulating the microbial ecosystem of the rumen to improve production efficiency by domestic ruminants. Based on growing concern over the use of antibiotics and other growth promotants in the animal feed industry, interest in the effects of microbial feed additives on animal performance has increased [1].

Yeast derived products, such as yeast cultures and extracts, are natural feed additives that can be classified as probiotics (live yeast) or prebiotics (non-living yeast). Supplementing cattle with live yeast, especially *Saccharomyces cerevisiae*, has been shown to improve the productive performance of ruminant. More specifically, live yeast derivatives reduce ruminal lactate production, alleviate dietary protein loss as ammonia and stabilize ruminal pH [2, 3].

Yeast products are widely utilized as feed additives for ruminant animals in many parts of the world There is a widespread belief among dairy and beef producers and ruminant nutritionists that yeast products are beneficial by enhancing feed intake and overall animal performance and is safe tool for enhancing ruminant production and safeguarding health [4]. However, the mechanisms have been proposed to explain why yeast products could stimulate DM intake and productivity in growing and lactating cattle are presented by [5]. The oldest hypothesis is that the yeasts are able to grow at least for a short period of time, in the rumen thereby directly enhancing fiber digestion and/or producing nutrients that stimulate growth of rumen bacteria, which do the bulk of the fiber digestion. It has also been suggested that yeasts utilize nutrients, such as lactic acid which, if allowed to accumulate in the rumen, could suppress bacterial growth and/or suppress DM intake by driving rumen pH down [6]. A more recently suggested possibility is that growth

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of yeast in the rumen utilizes the trace amounts of dissolved oxygen, particularly at the interface of the cellulolytic bacteria and fiber, thereby stimulating growth of rumen bacteria, to which oxygen is toxic [7]. It seems clear that for these mechanisms to be operative, yeasts in the product have to be viable, in the sense of being able to grow for at least a short period of time in the rumen. Hence the origins of the debate between live and dead yeast products. The alternate mechanism is that it is the yeast culture itself, which is created in the yeast fermentation process, which provides a mixture of micro-nutrients to stimulate bacterial growth in the rumen thereby facilitating increased fermentation of fiber and/or utilization of end products of fiber fermentation to prevent their accumulation in the rumen. Supporters of this theory point to a limited research base showing that when cultures of live brewers or fermentation yeasts are fed to ruminants, there are few, if any, changes to rumen fermentation and/or animal performance [4]. Feeding a yeast following weaning has been found to increase feed intake, daily gain and feed efficiency in beef cattle while in lactating dairy cows, feeding yeast and yeast cultures products significantly increased milk production, milk composition and dry matter intake [8].

So this work aimed to investigate the impact of adding rumi yeast in Barki sheep rations on their productive performance, drinking water and economic evaluation.

MATERIALS AND METHODS

The present experiment was carried out at the Sheep and Goats' Units in El-Bostan area in Nubaria, El-Behira government which belongs to the Animal Production Department, National Research Center, Dokki, Giza, Egypt.

Animals and Feeds: Twenty one of growing male Barki lambs aged 5-6 months with an average weights (27.200 ± 1.938 kg) were randomly distributed into three equal groups to investigate the impact of incorporation different levels of commercial product (Rymi yeast) that used as feed additive in ruminants ration's on their productive performance and economic evaluation.

Rymi yeast was added to concentrate feed mixture (CFM) at (0, 1 and 2 grams per one kg CFM) for R_1, R_2 and R_3, respectively.

Experimental animals were housed in semi-open pens and fed as group feeding for 84 days and the experimental rations were offered for different experimental groups at 4% dry matter of live body weight (LBW), tested rations were divided in to 60% concentrate feed mixture (CFM) and 40% roughage (wheat straw).

Each group received one of the three tested rations that classified as the following:

R_1: 1st experimental ration assigned as control and it contained 0% Rymi yeast (RY).

R_2: 2nd experimental contained 0.10% RY (1 g / kg CFM).

R_3: 3rd experimental ration replace ration contained 0.20% RY (2 g / kg CFM).

Daily amounts of different tested rations were adjusted every 2 weeks according to body weight changes and it were offered twice daily in two equal portions at 800 and 1400 hours, while feed residues were daily collected, sun dried and weekly weighed. Fresh water was always freely available in plastic containers. Individual body weight change was recorded weekly before receiving the morning ration. chemical analysis (%) of the ingredients are illustrated in (Table 1). Meanwhile, composition and chemical analysis (%) of tested rations are presented in (Table 2).

Analytical Procedures: Chemical analysis of ingredients and tested ration samples were analyzed according to AOAC [9] methods. Neutral detergent fiber, acid detergent fiber and acid detergent lignin were determined according to Goering and Van Soest [10] and Van Soest *et al.* [11]. Meanwhile, hemicellulose and cellulose content were calculated by difference using the following equations:

Hemicellulose = NDF - ADF. Meanwhile, Cellulose =ADF - ADL.

Calculations: Non-fibrous carbohydrates (NFC) were calculated according to [12] using the following equation: NFC = 100 - {CP + EE + Ash + NDF}.

Gross energy (kcal/ kg DM) was calculated according to Blaxter [13].

Each g CP = 5.65 Kcal, g EE = 9.40 kcal and g CF and NFE = 4.15 Kcal.

Digestible energy (DE) was calculated according to NRC [14] by applying the following equation: DE (kcal/ kg DM) = GE × 0.76.

Economic Evaluation: Economical efficiency for the experimental rations used in this study depended on both local market price of ingredients and price of sheep live body weight.

Economic evaluation was calculated as follows:
The cost for 1-kg gain = total cost per Egyptian pound (LE) of feed intake/ total gain (kilogram).

Statistical Analysis: Data collected of live weight, average daily gain, feed intake, feed conversion and drinking water were subjected to statistical analysis as one-way analysis of variance according to SPSS [15]. Duncan's Multiple Range Test [16] was used to separate means when the dietary treatment effect was significant according to the following model:

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

where: Y_{ij} = observation. M = overall mean. T_i = effect of experimental rations for i = 1-3, 1 = (R_1: 1st experimental ration assigned as control and it contained 0% Rymi yeast (RY), 2 = {$R_{2:}$ 2nd experimental contained 0.10% RY (1 gram /kg CFM) and 3 = ($R_{3:}$ 3rd experimental ration replace ration contained 0.20% RY (2 grams / kg CFM).

e_{ij} = the experimental error.

RESULTS AND DISCUSSION

Chemical Analysis of Ingredients, Concentrate Feed Mixture and the Experimental Rations: Data of Tables (1 & 2) mentioned that concentrate feed mixture formulation covered the nutrient requirement of growing sheep. It contains 16.97 % CP; 4289 kcal/kg DM of gross energy, this related to depending on using high quality sources of feedstuffs in CFM formulations. On the other hand, the experimental ration contains 11.48% CP; 18.28% CF; 2.67% EE; 57.33% NFE; % 10.24 ash; 4037 and 3068 kcal/kg DM of gross and digestible energy, respectively. Values of cell wall constituents includes NDF, ADF, ADL, hemicellulose and cellulose were 52.06; 34.63; 6.09; 17.43 and 28.43, respectively. Chemical analysis of yellow corn, barley, soybean meal and wheat straw in the present study were near from the values reported by [17-25].

Productive Performance of the Experimental Groups: Data presented in Table (3) cleared that adding Rumi yeast (RY) at 0.10 and 0.20% improved their values of final weight (FW), total body weight gain (TBWG) and average daily gain (ADG). With increasing level of adding from RY both TBWG and ADG were significantly ($P<0.05$) increased in comparison with the control (contained 0% RY). Dietary treatments had no significant effect on both concentrate feed mixture (CFM) and wheat straw intakes. Adding RY had no significant effect ($P>0.05$) on all calculated of feed intakes for dry matter intake (DMI), crude protein intake (CPI), non fiber carbohydrates intake (NFCI), that expressed as g/h/day, g/kg$W^{0.75}$ or kg/ 100 kg live body weight (LBW) or gross energy intake (GEI) and digestible energy intake (DEI) that expressed as kilo calories/h/day, kilo calories/ kg$W^{0.75}$ or Mega calories/ 100 kg live body weight (LBW). These results mention that adding RY not affected on the palatability of feed intake. Feed conversion that expressed as g. intake/ g. gain of DM, CP or NFC or feed conversion that expressed as kilo calories intake per g. gain of GE or DE were insignificantly ($P>0.05$) improved by adding RY at 0.01 or 0.20% comparing to the control one (0% RY).

Results of growth performance in the present study in agreement with those found by [8] who noted that feeding a yeast following weaning has been found to increase feed intake, daily gain and feed efficiency in beef cattle while in lactating dairy cows, feeding yeast and yeast cultures products significantly increased milk production, milk composition and dry matter intake. Dry matter intake (DMI) is often considered to be a function of the initial rate of fibber digestion; early stimulation of ruminal activity can be expected to have a major impact on the feed consumption and can provide a driving force for improved animal performance [4]. Yeast cultures (YC) have also been fed to pre-partum cows improving DMI as noted by Dann *et al.* [26]. Also, feeding YC has increased dry matter intake as pointed by Dawson and Tricarico [27]. Furthermore, Allam *et al.* [28] reported that DMI tended to increase significantly by the addition of yeast with level of 2.5 and 5 g/h/day. In addition to, El Ashry *et al.* [29] noticed that DMI from concentrates was increased from 18.26 to 19.86 g/kg LBW when (*Sacchromyces Cerevisiae*) was added to the diet of male barky lambs. However, Saleh *et al.* [30] found that adding active dry yeast (ADY) to male lambs tended to increase insignificantly DMI from concentrate feed mixture (CFM) and rice straw (RS). The positive effect on animal production, when observed, is better explained by an increase of feed intake rather than a better feed digestibility. The YC stimulated the rate of degradation of solid feeds in the rumen within the first

Table 1: Chemical analysis of the different ingredients

	Feed ingredients				
Item	Yellow corn	Barley grain	Soybean meal	Wheat straw	CFM
Moisture	9.36	10.11	7.66	6.04	8.99
Chemical analysis (%) on DM basis					
Organic matter (OM)	98.30	90.75	94.74	84.79	93.06
Crude protein (CP)	9.10	14.36	44.00	3.26	16.97
Crude fiber (CF)	4.66	8.82	5.16	37.41	5.53
Ether extract (EE)	4.15	3.88	0.75	1.76	3.28
Nitrogen free extract (NFE)	80.39	63.69	44.83	42.36	67.28
Ash	1.70	9.25	5.26	15.21	6.94
Cell wall constituents					
Neutral detergent fiber (NDF)	36.38	42.18	36.39	75.31	36.57
Acid detergent fiber (ADF)	20.12	10.76	27.18	58.26	18.88
Acid detergent lignin (ADL)	2.35	6.25	6.28	9.32	3.93
Hemicellulose[1]	16.26	31.42	9.21	17.05	17.69
Cellulose[2]	17.77	4.51	20.90	48.94	14.95
Cell soluble-NDF[3]	63.62	57.82	63.61	24.69	63.43
Non fibrous carbohydrates (NFC)	48.67	30.33	13.60	4.46	36.24
Gross energy (kcal/kg DM)	4434	4185	4631	3660	4289
Digestible energy (kcal/kg DM)	3370	3181	3520	2782	3260

[1]Hemicellulos = NDF – ADF. [2]Cellulose = ADF – ADL.
[3]Cell soluble-NDF = 100 – NDF. [4]NFC = 100 – {CP + EE + Ash + NDF}.

Table 2: Composition and chemical analysis of the concentrate feed mixture and the experimental rations

			Experimental rations		
Item	CFM	WS	R_1	R_2	R_3
Level of rumi yeast (RY) addition			0% RY	0.10 % RY	0.20 % RY
Composition (kg/ ton)					
Yellow corn	550		Basal ration cmposed of	Basal ration +	Basal ration +
Soybean meal	200		60 % CFM + 40 % WS	1 gram RY / kg CFM	2 grams RY / kg CFM
Barly grain	220				
Lime stone	10				
Sodium chloride	10				
Vitamin and mineral mixture[1]	10				
Rymi yeast	-				
Price of Ton (LE)	4715	1500			
Calculated of chemical analysis (%)					
Moisture			8.99	6.04	7.81
Chemical analysis on DM basis (%)					
Organic matter			93.06	84.79	89.76
Crude protein			16.97	3.26	11.48
Crude fiber			5.53	37.41	18.28
Ether extract			3.28	1.76	2.67
Nitrogen free extrct			67.28	42.36	57.33
Ash			6.94	15.21	10.24
Cell wall constituents (%)					
Neutral detergent fiber (NDF)			36.57	75.31	52.06
Acid detergent fiber (ADF)			18.88	58.26	34.63
Acid detergent lignin (ADL)			3.93	9.32	6.09
Hemicellulose[2]			17.69	17.05	17.43
Cellulose[3]			14.95	48.94	28.43
Cell soluble-NDF[4]			63.43	24.69	47.58
Non fiber carbohydrates (NFC)			36.24	4.46	23.55
Gross energy (GE), kcal/ kg DM			4289	3660	4037
Digestible energy (DE), kcal/ kg DM			3260	2782	3068

[1]Vitamin & Mineral mixture: Each kilogram of Vit. & Min. mixture contains: 2000.000 IU Vit. A, 150.000 IU Vita. D, 8.33 g Vit. E, 0.33 g Vit. K, 0.33 g Vit. B_1, 1.0 g Vit. B_2, 0.33g Vit. B_6, 8.33 g Vit.B_5, 1.7 mg Vit. $B1_2$, 3.33 g Pantothenic acid, 33 mg Biotin, 0.83g Folic acid, 200 g Choline chloride, 11.7 g Zn, 12.5 g Fe, 16.6 mg Se, 16.6 mg Co, 66.7 g Mg and 5 g Mn.

CFM: concentrate feed mixture. WS: Wheat straw.

[2]Hemicellulos = NDF - ADF. [3]Cellulose = ADF – ADL. [4]Cell soluble-NDF = 100 – NDF.

Table 3: Productive performance of the experimental groups

Item	Experimental rations 0 % RY R_1	0.10 % RY R_2	0.20 % RY R_3	SEM
Lambs number in each experimental group	7	7	7	-
Initial weight (kg)	27.300	27.100	27.200	1.938
Final weight (FW, kg)	39.900[b]	40.960[ab]	42.750[a]	2.580
Total body weight gain (TBWG, kg)	12.600[c]	13.860[b]	15.550[a]	1.416
Experimental duration period	84 days			
Average daily gain (ADG, g/day)	150[c]	165[b]	185[a]	16.81
Average body weight, kg*	33.600	34.030	34.975	2.169
Metabolic body weight ($kgW^{0.75}$)	13.956	14.090	14.382	0.666
Feed intake				
Concentrate feed mixture (CFM), g	816	811	839	43.22
Wheat straw (WS), g	411	407	426	4.23
Dry matter intake (DMI) as				
g/h/day	1227	1218	1265	40.62
$g/kgW^{0.75}$	87.92	86.44	87.96	2.84
kg/ 100 kg live body weight (LBW)	3652	3579	3617	117.35
Crude protein intake (CPI) as				
g/h/day	141	140	145	4.6
$g/kgW^{0.75}$	10.10	9.94	10.08	0.32
g/ 100 kg live body weight (LBW)	420	411	415	13.36
Non fiber carbohydrates intake (NFCI) as				
g/h/day	289	287	298	9.49
$g/kgW^{0.75}$	20.71	20.37	20.72	0.66
g/ 100 kg live body weight (LBW)	860	843	852	27.48
Gross energy intake (GEI) as				
kcal/h/day	4953	4917	5107	164
$kcal/kgW^{0.75}$	355	349	355	11.52
Mcal / 100 kg live body weight (LBW)	14.741	14.449	14.602	0.47
Digestible energy intake (DEI) as				
kcal/h/day	3764	3737	3881	125
$kcal/kgW^{0.75}$	269	265	270	8.61
Mcal / 100 kg live body weight (LBW)	11.202	10.98	11.096	0.36
Feed conversion expressed as g. intake / g. gain of				
Dry matter	8.18	7.38	6.84	0.31
Crude protein	0.94	0.85	0.78	0.036
Non fiber carbohydrates	1.93	1.74	1.61	0.074
Feed conversion expressed as kcal intake / g. gain of				
Gross energy	33.02	29.80	27.61	1.255
Digestible energy	25.09	22.65	20.98	0.952

a, b and c: Means in the same row having different superscripts differ significantly ($P<0.05$).
SEM: Standard error of mean. *Average body weight, kg = (Initial weight + final weight) / 2

6 to 8 hrs after the meal; the animals can ingest more dry matter to fill their digestive compartment at the same level and this physical regulation could be involved to explain the higher feed intake in treatment animals Pedro *et al.* [31]. Another factor that can influence the physical regulation of intake is the outflow rate of digesta from the rumen as reported by [32]. In addition to, Panda *et al.* [33] found that mean daily gain for male calves which were given a daily dose of yeast cell suspension (*Sc*) was greater than that of control (478±40 g vs. 339±28 g). Saleh *et al.* [30] noted that adding active dry yeast (ADY) significantly increased total gain and ADG by 12.1% and that ADG was significantly increased until 85 days of experiment. EL Ashry *et al.* [29] reported that adding yeast culture in male Barki lambs caused an increasing in their ADG from 139.3 to 148.3 g, but the difference was not significant. Meanwhile, EL-Ashry *et al.* [34] recorded that adding live dried yeast in growing Buffalo calves improved ADG from 678.4 to 744.6 g for experiment which extended for 9 months and the differences between both

was not significant. On the other hand, Galvao *et al.* [35] showed that addition of *Saccharomyces cerevisiae* (*Sc*) in beef cattle the realized an increase in their live weight and this improvement depending on the type of diet tested. Growth parameters (average daily gain, final weight, DM intake, feed to gain ratio) have been reported to be improved by daily ADY supplementation. An increase in body weight gain and feed efficiency in calves has been seen when yeast culture added to the diet [36]. When. Lesmeister *et al.* [37] added *Saccharomyces cerevisiae* in Holstein calves starter from 2 to 42 days of age they found that average daily gain and DMI was higher for the treatment group. Laborde [38] observed that calves that received starter containing yeast culture showed significant increased body weight when compared to other calves at week 6 and 8 and concluded that yeast cultures have been shown to improve growth performance and health of calves when supplemented in the diet. Moreover, Blezinger [39] noticed an improvement in weight gains of cattle fed concentrate feed mixture containing yeast culture and grazing fescue pasture, they found that yeast products such as *Saccharomyces cerevisiae* may assist in digestion of forages. On other hand, Macedo *et al.* [40] noted that their no differences were observed (P>0.05) between YC and control sheep groups on body weight (36.00 vs 36.75 kg), dry matter intake (68.10 vs 69.50 kg), average daily gain (290 vs 300 g/d) and feed conversion (4.22 vs 4.15 g DM/g gain). Meanwhile, Khadem *et al*. [41] noted that there was not effect on the feed conversion ratio , average of daily gain and live weight gain of finishing lambs fed diets supplemented with 10 g/kg *Saccharomyces cerevisiae*. Furthermore, Chaucheyras *et al*. [42] found that body weight gain in lambs improved when diet contained yeast culture in combination with monensin. Inclusion the probiotic in animal diets seemed to improve lambs growth as noted by Hassan and Hassan [43] it also, increased live weight gain and enhanced feed conversion ratio. Hassan and Hassan [44] reported that significant improvement in live weight gain and feed conversion ratio was associated with lamb fed on diet supplemented with local Iraqi probiotic or medicinal plants as compared with control diet. Iraqi probiotic contain *Saccharomyces cerevisiae* seemed to be more efficient to increase body weight , feed conversion and decreased mortality.

Drinking Water by the Experimental Groups: Data of (Table 4) cleared that average daily water intake were insignificantly (P>0.05) decreased with increasing the Rumi yeast (RY) in sheep rations. The corresponding values were 4100, 3600 and 3400 ml/h/day for R_1, R_2 and R_3, respectively. Generally, experimental sheep fed ration contained 0.20% RY recorded the lowest value of water intake that expressed as (ml/h/day, ml/ kgw$^{0.75}$, liter/ 100 kg live body weight, liter/ kg dry matter intake, liter/ kg non fibrous carbohydrate intake, liter/ M cal gross energy intake and liter/ M cal digestible energy intake and it was insignificantly (P>0.05) decreased comparing to that fed ration contained 0 or 0.10% Rumi yeast (RY).

Sonone *et al.* [45] fed crossbred calves in four groups for 90 days on different sources of roughage that includes Jowar Kadbi, soybean straw, green fodder (Hy. Napier) with concentrate to study its effect on their feed and water intake. They designed the groups as (T_1) composed of Jowar Kadbi, green fodder (Hy. Napier) and concentrate; (T_2) composed of Soybean straw, green fodder (Hy. Napier) and concentrate; (T_3) composed of Soybean straw and concentrate and (T_4) composed of soybean straw only. They noticed that the daily water intake of the calves was differ significantly between the feeding group, the calves from T_2 group drunk more (12.88) than that T_1 (12.50), T_3 (12.13) and T_4 (11.84). This trend indicated that the water in treatment T_1, T_2, T_3, T_4 were significant, indicating, that level of soybean straw had effect on the water consumption of calves. Also, the present results in agreement with those found by Omer *et al.* [23] who noted that values of water consumption were 2833, 3000 and 3250 ml/h/day when growing male Barki lambs fed complete feed mixture (CFM) replaced sesame meal (SM) 50 or 100% of soy bean meal (SBM). These values less than that recorded in the present study (4000, 3600 and 3100 ml/h/day). These may be related to differences in live body weight of the experimental sheep, the ingredient used in ration formulation and chemical analysis contents especially ash and CF in two comparison studies. DMI and water intake are positively associated [46] so ash is not the only constituent of dry matter in the feed, therefore, the ash contents could not be the sole cause of the changes in the water consumption. Also, Omer *et al.* [47] noted that Ossimi sheep received rations composed of 50% concentrate feed mixture plus 50% of peanut vein hay, beans straw, kidney beans straw, or linseed straw increased (P<0.05) drinking water compared to control group that offered ration composed of (50% concentrate feed mixture plus 50% berseem hay) Also, they recorded that the corresponding values of drinking water were 3088, 3742, 4650, 3660 and 3038 ml/h/day for control and the other four experiment groups mentioned above. On the other hand, Ahmed and Abdalla [48] showed that

Table 4: Drinking water by the experimental groups

	Experimental rations			
	0 % RY	0.10 % RY	0.20 % RY	
Item	R_1	R_2	R_3	SEM
Drinking water calculated as				
Metabolic body weight size ($kgW^{0.75}$)	13.956	14.090	14.382	0.666
Average body weight *	33.600	34.030	34.975	2.169
ml/head/day	4100	3600	3400	186.5
ml/ kg $W^{0.75}$	294	256	236	13.679
Liter/ 100 kg live body weight (LBW)	12.202	10.579	9.721	0.572
Liter/ kg dry matter intake	3.341	2.956	2.688	0.155
Liter/ kg crude protein intake	29.078	25.714	23.448	1.348
Liter/ kg non fibrous carbohydrate intake	14.187	12.544	11.409	0.659
Liter/ M cal gross energy intake	0.828	0.732	0.666	0.038
Liter/ M cal digestible energy intake	1.089	0.963	0.876	0.050

a and b: Means in the same row having different superscripts differ significantly ($P<0.05$).

SEM: Standard error of mean. RY: Rymi yeast (RY)

*Average body weight = initial weight + final weight / 2

Table 5: Economic evaluation of the experimental groups

	Experimental rations		
	0 % RY	0.10 % RY	0.20 % RY
Item	R_1	R_2	R_3
Daily feed intake (fresh, kg)			
Concentrate feed mixture (CFM), kg	0.897	0.891	0.922
Value of 1-kg CFM (LE)	4.175		
Wheat straw (WS), kg	0.434	0.430	0.450
Value of 1-kg WS (LE)	1.500		
Rymi yeast (RY), g	without	1 gram	2 grams
Value of one gram RY (LE)	0.025		
Daily feeding cost (LE) [a]	4.88	5.10	5.52
Average daily gain (kg)	0.150	0.165	0.185
Value of one kg live body weight (LE)	70		
Value of daily gain (LE)	10.50	11.55	12.95
Daily profit above feeding cost (LE)	5.62	6.45	7.43
Relative economical efficiency [b]	100	114.8	132.2
Feed cost (LE/ kg gain)	32.53	30.91	29.84

LE = Egyptian pound equals 0.06 American dollars ($) approximately.

[a]: based on price of 2020.

[b]: Assuming that the relative economic efficiency of control ration (R_1) equals 100

replacing 50% of cotton seed cake (CSC) by sesame seed cake (SSC) in yearling sheep had no effect on water intake (3.04 vs. 3.00 l/kg DM intake) for CSC and SSC, respectively. They also, think that ash content in the two sources in the same range had not caused any adverse effect on quantity water consumption.

Economic Evaluation of the Experimental Groups: Data of economic evaluation presented in (Table 5) cleared that gradually incorporation of Rumi yeast (RY) from 0 to 0.10% and 0.20% realized increasing in their daily feeding cost from 4.88 to 5.10 and 5.52 LE for R_1, R_2 and R_3, respectively. Resulting for increasing or improving their daily gain occurred an improving in daily profit above feeding cost that recorded 5.62, 6.45 and 7.43 LE for R_1, R_2 and R_3, respectively. Also, relative economical efficiency was improved by 114.8 and 132.2% for (R_2 and R_3), respectively when assuming that the relative economic efficiency of R_1 (control ration) equals 100. Values of feed cost (LE/ kg gain) was decreased from 32.53 to 30.91 and 29.84 LE for R_1, R_2 and R_3, respectively. These decreasing in feed cost (LE/ kg gain) equals 4.98% and 8.27% for

R_2 and R_3, respectively comparing to R_1. In the present study we using wheat straw in feeding sheep as a main source of roughage, our results were in harmony with that obtained by Adangale *et al.* [49] who, made a comparison between jowar straw and soybean straw through out designed an experiment using Nine H.F.X Deoni cross bred interse calves aged 6 to 12 months and it divided into three groups. First 1[st] composed of jowar straw ad lib plus concentrate and considered as control (T_0); meanwhile the (T_1) received jowar straw 50 % and soybean straw 50 % + concentrate, but (T_2) received 100% soybean straw + concentrate as per requirement. They noted that feeding cost per kg body weight gain was decreased with increasing the level of soybean straw. The corresponding values were 48.99, 43.09 and 39.11 for T_0, T_1 and T_2, respectively. Also, the similar trend was recorded by Talokar [50] on feeding of soybean straw and Jowar straw as main source of roughage with concentrate in buffalo heifers. Furthermore, Mahmoud and Ghoneem [51] noticed decreasing in feed cost per one kg 7% fat corrected milk (FCM) in Egyptian lactating buffaloes fed ration composed of (50% roughage and 50% concentrate feed mixture.

CONCLUSION

It can be mentioned that, under condition as that available in this study, adding Rumi yeast (commercial product) as feed additive in Barki sheep ration realized an observing improving in their performance, in addition to it occurring an improving in their relative economic efficiency. So this will be encourage the farmers to use as this additive in sheep rations to obtained an improvements in profitability or net revenue through out decreasing feed cost/ kg gain.

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