Effect Of Some Yeast And Minerals On The Productive And Reproductive Performance In Ruminants

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1-Effect of Live Dried Yeast Supplementation on Digestion Coefficients, Some Rumen Fermentation, Blood Constituents and Some Reproductive and Productive Parameters in Rahmani Sheep
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Abstract: This study was performed to evaluate the influence of dietary supplementation of live dried yeast (Yea-Sacc 1026) (*Saccharomyces cerevisiae*) on digestion coefficients, some rumen fermentation, blood constituents and some productive and reproductive parameters in Rahmani sheep. Twenty one Rahmani ewes 2-4 years of age, 47.45±1.75 Kg average body weight and 2-3 parities were selected randomly and divided into three similar groups according to their body weight (7 ewes in each) with a completely randomized design .The experiment was conducted 60 days before lambing and 60 days after lambing (suckling period). Experimental groups as follows:1-The control group fed the basal ration without any supplementation., 2- The 1st treated group fed on control ration supplemented with 5g/h/d live dried yeast (Yea-Sacc 1026) and 3- The 2nd treated group fed on control ration supplemented with 7.5g/h/d live dry yeast (Yea-Sacc 1026). The basal ration composed of concentrate feed mixture: roughage (berseem 2nd cut + rice straw) (60:40%). Digestibility trial was carried out using nine male yearling Rahmani lambs with average weight 31.60 ± 0.72 kg and aged 14 months. Obtained results revealed that the digestibility of DM, CP and CF was higher with 5 and 7.5g/h/d live dried yeast supplemented groups than control group (P<0.05). Dried yeast supplementation improved nutritive value as total digestible nutrients (TDN) and digestible crude protein (DCP). Ruminal pH was higher for all groups before morning feeding then decreased at 3hrs-post feeding. Ruminal ammonia-N was lower in DY-supplemented groups than control group (P<0.05). Total VFA followed an opposite pattern (P<0.05). Total VFA had inversely relationship with ruminal pH. Concentrations of blood plasma albumin, glucose, cholesterol and AST and ALT activities were significantly different (P<0.05) during late pregnancy among the three groups. During suckling period blood plasma total protein, glucose, urea and AST concentrations were higher (P<0.05) in supplemented groups than control one. Live dried yeast supplementation had no effect on reproductive parameters. In addition 4% fat corrected milk yield, total solids(%), protein (%),avg. fat yield, avg. protein yield and avg. lactose yield were significantly higher (P<0.05) in live DY-supplemented groups than control one. Lambs weaning weight and daily gain were higher in live DY-supplemented groups than control group (P<0.05). In conclusion, supplementation of live dried yeast (Yea - Sacc 1026) to diets of sheep at levels (5 or 7.5 g/h/d) had positive and beneficial effects on enhance digestion and nutritive values, rumen fermentation, blood constituents consequently enhance milk yield and composition as well as daily weight gain for lambs.

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1. Introduction

The lack of sufficient feeds to meet the nutritional requirements of the existing animal population is one of the most critical problems of animal production in Egypt (Yousef and Fayed, 2001).For many years, ruminant nutritionists and microbiologists have been interested in manipulating the microbial ecosystem of the rumen to improve feed utilization and production efficiency by ruminants. The manipulation of rumen microbial activity including dietary antibiotics and probiotics (bacterial and yeast culture) has been widely studied during the last 20 years. These probiotics are live microbial feed supplements and have been used as growth promoters to replace the widely used antibiotics and synthetic chemical feed supplements (Higginbotham and Bath, 1993; Brydt *et al*., 1995; Sumeghy, 1995: Strzetelski, 1996 and Dawson, 2002).

Using yeast culture in ruminant diets can improve the animal performance. Dawson (1990) reported that, yeast culture increased ruminal cellulose digestion and consequently improved feed efficiency and gain. Also, increased microbial growth in the rumen and enhanced microbial protein synthesis. Yeast cultures (YC) are very beneficial in the rumen. Several reasons for improvements in ruminal fermentation from feeding YC have been suggested. Numerous studies (Sune, 1998; Jouany, 2001; Alshaikh *et al*., 2002; Lila *et al*., 2004; Tricarico *et al*., 2006; Chevaux and Fabre, 2007) documented positive effects of YC not only on the

rumen environment, but also on the improvement of microbial activities.

Yeast culture supplementation was found to decrease NH_3-N level in the rumen (Kamel *et al*., 2000; Khattab *et al*., 2003 and Fayed *et al*., 2005) for sheep and Gado *et al*. (1998b) working on goats, and maintain rumen pH (Williams and Newbold, 1990) by stimulating lactic acid utilizing bacteria *Selenomonas ruminantium* (Nisbet and Martin, 1990). *Selenomonas ruminantium* is a common Gram-negative ruminal bacterium that can account for up to 51 % of the total viable bacterial counts within the rumen (Caldwell and Bryant, 1966). Dawson (1994) showed that, yeast or yeast culture are rich source of vitamins, enzymes and other important nutrients and co-factors which make them attractive as digestive enhancers as a basic source of nutrients. Allam *et al*. (2001) and El-Shaer (2003) reported that, all nutrients digestibility were increased for sheep. Also, improve nitrogen balance (Ahmed and Salah, 2002 and El-Ashry *et al*., 2003). Fayed *et al*. (2005) and Abdel-Latif (2005) found an increase in total VFA due to adding yeast culture in sheep diets. Newbold *et al*. (1995 and 1996) showed that, yeast lead to an increase in viable ruminal bacteria. Gado *et al*. (1998a) reported an improvement in average daily gain and feed conversion for growing goats when yeast culture was supplemented to their diet. *Saccharomyces cerevisiae* can stimulate rumen bacteria depends on its respiratory activity (Newbold *et al*., 1996), which allow it to scavenge O_2 and protect the strictly anaerobic bacteria. Yeast culture also has been reported to stimulate utilization of hydrogen by ruminal acetogenic bacteria (Chaucheyras *et al*., 1995). *Saccharomyces cerevisiae* reported to balance the energy and the acid-base metabolism in dairy cattle resulted in a significantly higher milk production (Brydt *et al*., 1995) and (Masek *et al*. 2008 and Helal and Abdel-Rahman ,2010) came to the same conclusion of sheep and increasing milk yield of ewes is an important factor for the production of robust lambs at weaning. Ismaiel *et al.* (2010) reported that yeast culture increased average daily gain of lambs. Since, *Saccharomyces cerevisiae* is of no risk on human health when included in the animal rations (El-Ashry *et al*., 2001).

Using yeast culture (YC) in ruminant diets found to improve performance (Williams, 1989) and it was found to increase blood total protein (El-Shaer, 2003), glucose concentration (Sharma *et al*., 1998 and Mukhtar *et al*., 2010) and decrease cholesterol (Fayed *et al*., 2005). Also an improvement in reproductive performance was also obtained by Abdel-Khalek (2003) in Friesian cows and Ebrahim (2004) in Egyptian buffaloes.

Dried yeast supplements are more comprehensive for dietary purposes due to broader distribution, storage and application. Depending on production technology, they can be administered in the form of a probiotic containing live cells or a prebiotic comprising dead cells (Dobicki *et al*., 2007 and Milewski, 2009). Supplementation of diet for lambs with dried yeast *Saccharomyces cerevisiae,* had a significant effect on lambs meat quality (Milewski and Zaleska, 2011).

The objectives of the present study were to illustrate the effect of live dried yeast supplementation (Yea-Sacc 1026) during late two months of gestation period and suckling period (two months) on some reproductive parameters, some blood components and milk yield and its composition of Rahmani ewes and weight gain of their offspring, as well as some nutritional parameters (nutrients digestibility, nutritive value, and some rumen fermentation parameters).

2. Material And Methods

***Experimental animals and management*:**

The present study was carried out at the experimental farm at Shalkan, Qalyobeiah governorate belonging to the Faculty of Agriculture, Ain - Shams University. Twenty one Rahmani ewes 2-4 years of age, 47.45±1.75 Kg average body weight and 2-3 parities (in the last 60 days of pregnancy) were divided into three similar groups according to their body weight (7 ewes each) as follows: 1) The control group fed the basal ration without any supplementation. 2) The 1st treated group fed the control ration supplemented with 5g/h/d live dried yeast (Yea-Sacc 1026) and 3) The 2nd treated group fed the control ration supplemented with 7.5g/h/d live dried yeast (Yea-Sacc 1026). The basal ration composed of concentrate feed mixture: roughage (berseem 2 nd cut + rice straw) (60:40%) (Table 1). The experimental ingredients were chemically analyzed for determination of dry matter (DM), organic matter (OM), crude protein (CP), ether extract (EE), crude fiber (CF), nitrogen free extract (NFE) and ash contents according to A.O.A.C. (1990). Live dried yeast was swallow for individual animal in treated groups. The experiment began 60 days before lambing and lasted for 60 days post lambing (suckling period). All animals were free from diseases and parasites and housed in semi-shaded well ventilated pens. Ewes fed on the basis of their body weight according to NRC (1989). The basal ration composed of 60% concentrate feed mixture (CFM): 40% roughage (berseem 2nd cut and rice straw (RS)). Concentrate feed mixture offered to the animals at 8.00 a.m. and berseem plus rice straw at 10.30 a.m. Fresh drinking water was offered twice daily at 8 am. and 4 pm.

Blood sampling:

Blood samples were collected pre lambing at 60, 30 days and at lambing during late pregnancy period and 15, 30 and 60 days post lambing (suckling period). Blood samples were collected in dried clean EDTA

contain tubes by jugular vein puncture from 5 ewes from each group in the morning just before feeding and drinking and immediately centrifuged at 4000 rpm for 15 minutes. Obtained plasma was carefully taken and stored at -20°C until analysis. Total protein and albumin were determined according to (Doumas and Biggs, 1972 a & b) and globulin concentration was calculated by the difference between total protein and albumin concentrations. Albumin / globulin ratio was also calculated. Glucose was determined according to Hyvarinen and Nikkla (1962). Liver function was assessed by measuring the activities of AST (alanine aminotransferase), ALT (aspartate aminotransferase) as described by Reitman and Frankel (1957), total cholesterol and urea (Henry, 1965) and creatinine (Bartels, 1971) using commercial colorimetric kits.

Table (1): Chemical composition of ingredients used by experimental animals on DM basis.

Ingredients	Item%						
	DM	OM	CP	EE	CF	NFE	Ash
CFM*	89.90	88.15	16.30	3.30	13.50	55.05	11.85
Berseem 2nd cut	15.30	86.30	16.40	1.90	20.40	47.60	13.70
Rice straw	90.20	84.20	3.91	1.14	39.03	40.12	15.80

*CFM, Concentrate feed mixture composed of non-corticated cotton seed 29%; yellow corn 26%; wheat bran 35% ; molasses 6%; limestone 3% and common salt 1%.

Reproductive parameters:

Reproductive traits of ewes in response to live DY supplementation were recorded including the following: Conception rate; percentage of ewes conceived of ewes joined. Fertility; percentage of ewes lambed of ewes joined. Lambing rate (prolificacy); percentage of lambed born (alive or dead /ewes lambed. Fecundity; percentage of lambs born/ewes joined. Reproductive ability; percentage of lambs weaned / ewes joined. Percentage of lambs weaned / ewes lambed .Kilograms of lambs born / ewes lambed and .Kilograms of lambs weaned / ewes lambed Twining rate, birth and weaning weights for lambs , total gain and average daily gain from birth to weaning. Mortality; percentage of dead lambs from birth to weaning according to Shahin (2000).

Milk samples:

Daily milk yield was recorded (7 ewes for each group) for the first 2 months of lactation (suckling period) until lambs weaning. Representative milk samples (about 0.5% of total milk produced) were taken at 15,30 and 60 days post lambing from each ewe at both millkings was recorded using milk suckling technique, twice daily at 7 am. and 4 pm. The lambs were separated from their dams at 4 pm. the day prior to the day of milk assessment and body weight was recorded at 7 am. and left them suckling from their dams for 30 minutes and body weight was recorded again. Residual milk was hand milked and recorded. Similar procedure was repeated at the evening suckling at 4 pm. The differences in the weight of lambs before and after suckling were added to give daily intake of suckling kids. Milk intake plus milk removed by hand milking represented daily milk yield. The same procedure was reported for milk yield for ewes by Shahin (2000), Moawd (2003) and Saleh (2004). Milk samples were collected at the same time of milk yield recording and kept at -20°C for analysis. Total solids, ash, total protein (Ling, 1963) and lactose (Barnett and Abd El-Tawab, 1957). Solids- not –fat (SNF) was calculated by difference. Animals were hand milked twice daily at 7am. and 4 pm. throughout the lactation period. 4% fat corrected milk was estimated using the formula of Gains and Overman (1938).

Digestibility trial and rumen samples:

Nine male yearling Rahmani lambs weighted on the average 31.60±0.72 kg and aged 14 months were kept and fed the same treatments individually in metabolic cages allowing separate collection of urine and feces as described by Maynard *et al*. (1979). The experimental animals were adapted to the cages for 14 days as a preliminary period followed by a 7-days collection period. Animals received their nutrient requirements according to NRC (1989). Every morning, feed residues if any, were collected, weighed and subtracted from the amount offered to calculate the actual feed intake. Feed and feces samples were also quantitatively collected for each animal, weighed and a 10% aliquot was taken and the composite samples were dried. DM content was determined, the dry samples were ground allowed to pass through 1 mm. screen sieve and kept for analysis. Proximate chemical analysis of feed and feces samples was done according to the A.O.A.C. (1990). By the end of the digestibility trial, rumen samples were collected by a stomach tube at zero and 3 hrs post-feeding. The rumen samples were strained through four layers of cheesecloth into a plastic containers and pH was immediately measured using a pH meter with glass electrode. Ammonia-N was estimated as soon as possible using the distillation method as described by Horn *et al*. (1981). Total volatile fatty acids were determined according to the technique described by Warner (1964).

Data were analyzed using GLM procedures of the SAS (SAS, 1996). Means were separated by using Duncan's multiple range test (Duncan, 1955).

3. Results and Discussion

Chemical composition of feedstuffs:

In general, the present results of the chemical composition values of CFM, Berseem, rice straw (Table, 1) are within the normal ranges reported in Egypt by several workers (Baraghit, *et al.* 2003, Saleh, *et al*. 2005 and El–Hosseiny, *et al*., 2008) .

Nutrients digestibility and nutritive values:

The tabulated data in Table (2) indicated that the digestibility of DM, CP and CF was higher with 5 and 7.5g/h/d dried yeast supplemented groups than control group (P<0.05). These results are in agreement with obtained by Allam *et al*. (2001), Ahmed and Salah (2002), AL-Dabeeb and Ahmed (2002), El-Shaer (2003), Ali (2005), Komonna (2007), El-Nahas *et al.* (2009), Hassan (2009), Paryad and Rashidi (2009) and Helal and Abdel-Rahman (2010) who found that sheep fed diets supplemented with yeast culture had higher nutrients digestibility than control diet. Also, similar trend was observed with the results reported by El-Ashry *et al*. (2001) and Shahin *et al*. (2005) for buffalo calves, Salem *et al*. (2002), Ebrahim (2004), Marghany *et al*. (2005) and Kholif and Khorshed (2006) for lactating buffaloes and Ghorab (2007) with Friesian calves .

An opposite trend was reported by Mukhtar *et al*. (2010) who reported that DM, CP and ADF digestibilities of sheep did not significantly effect by monensin or (Yea Sacc, *Saccharomyces cerevisiae)* supplementation. El-Kholi *et al*. (2005) with buffalo male calves had no effect on digestion coefficient of DM due to yeast supplementation. Abdel-Khalek *et al*. (2002) came to the same results with Friesian cows for OM digestibility. Also, Abdel-Ghani *et al*. (2004) found that OM digestibility was not affected by 10g yeast/h/d supplementation for Friesian cows.

The previous results for CP digestibility may be due to its effect on rumen bacteria especially rumen proteolytic bacteria. Williams (1989) indicated that yeast culture supplementation lead to increase CP digestibility and this effect may be due to the stimulation of rumen proteolytic bacteria.

Table (2): Nutrients digestibility and nutritive value of the experimental diets fed to male yearling Rahmani lambs as affected by live DY supplementation.

Item	Treatments		
	Control	5 g /h DY	7.5 g /h DY
Nutrients Digestibility, %			
DM	68.12 ± .87^{B}	72.35±1..94^{A}	72.56 ±.77^{A}
OM	72.11±.91	74.33±.51	73.82±.81
CP	71.12 ±.90^{B}	74.85±.66^{A}	75.55±1.85^{A}
CF	60.02±1.26^{B}	62.90±.96^{AB}	63.65±.70^{A}
EE	74.33±.59	75.21±.57	75.64±.47
NFE	74.55±.48	76.42±.78	76.67±.93
Nutritive values ,%			
TDN	63.25±.49^{B}	65.35±.34^{A}	65.83±.52^{A}
DCP	9.85±.12^{B}	10.35 ±.09^{A}	10.45±.25^{A}

$^{A, B, C,}$values in the same row not sharing the same superscripts are significantly different (P<0.05).

The addition of yeast culture (*Saccharomyces cerevisiae*) to the sheep diets improved the CP digestibility which in turn leads to increase degradability of protein and flow of microbial nitrogen to post ruminal (Wiedmeier *et al*., 1987 and Newbold *et al*., 1990). Also, improvement of CF digestibility in the present study may be explained on the basis of increasing the number of rumen cellulolytic bacteria due to yeast culture supplementation. In this respect, Williams (1989), Gomez-Alarcon *et al*. (1990), Newbold *et al*. (1990) and Yoon and Stern (1996) found an increase in rumen cellulolytic bacteria with the addition of YC and/or increase rumen bacteria activity (Erasmus *et al*., 1992 and Dawson, 1993). Yeast culture provides stimulatory factors to rumen bacteria (i.e., organic acids, B vitamins and amino acids) that stimulate growth of ruminal bacteria which utilize lactate and digest cellulose (Piva *et al*., 1993; Callaway and Martin, 1997; Putnam *et al*., 1997 and Wohlt *et al*., 1998). Kamel *et al*. (2000) also reported that, the addition of *S. cerevisiae* to berseem hay given as a sole diet to sheep stimulated the proliferation of rumen microorganisms which in turn was associated with enhancement of cell wall digestion. Also, Paryad and Rashidi (2009) reported that yeast supplementation significantly (P<0.05) increased digestibility of dry matter (DM), organic matter (OM), crude protein (CP), NDF and ADF of tomato pomace where the gross digestibility derived from the supplementation was superior in 4 gm yeast compared to the control sheep group.

As shown in Table (2) illustrate that DY-supplemented groups had higher nutritive values as TDN and DCP than control group (P<0.05). These findings are in accordance with those obtained by Allam *et al*. (2001), Al-Dabeeb and Ahmed (2002), Ali

(2005), Komonna (2007) and Helal and Abdel-Rahman (2010) who reported that yeast culture and commercial probiotic tended to significantly improve TDN and DCP. Similar results were reported also by El-Ashry *et al*. (2001), Abdel-Latif (2005) and Shahin *et al*. (2005) with buffalo calves and Ebrahim (2004) and Marghany *et al*. (2005) with lactating buffaloes.

Generally, yeast culture has been observed to improve the digestibility of most nutrients (Wiedmeier *et al*., 1987; Williams *et al*., 1991; Wohlt *et al*., 1998; Harris *et al*., 1992; Dawson, 1994; Robinson, 1997 and Putnam *et al*., 1997). Yeast culture can enhance the digestive process associated with microorganism in the gastrointestinal tract. Some of these enhancements may have been related directly to stimulation of microbial activity and microbial growth as a result of yeast culture stimulation (Newbold *et al*., 1990). Ebrahim (2004) and Abdel-Latif (2005) found marked increase in protozoal count and microbial yield in ruminal liquor of buffaloes fed Gustor nature (mixture of yeast and malate) as compared with the control animals. Robinson (1997) stated that yeast culture supplementation tended to increase net digestion in the fore stomach particularly of fiber leading to increase energy output. Yoon and Stern (1996) found that yeast increased initial rate of forage digestion in the rumen.

The confliction in the results concerning the effect of DY on nutrients digestibility could be due to the variation in feeding system, species and age of animals, frequency of feeding, dose of yeast and its type, physiological state, environmental conditions, ration composition and plan of nutrition.

Rumen parameters:-

Ruminal pH value is one of the most important factors, which affect microbial fermentation in the rumen and influenced its functions. As shown in Table (3) ruminal pH values were higher for all treatments before morning feeding then deceased steadily at 3hrs-post feeding and the differences among DY levels on pH value were not significant. These results are in agreement with those reported by Al-Dabeeb and Ahmed (2002), Ali (2005) and Komonna (2007) who reported that yeast culture or commercial probiotic had no effect on ruminal pH. Similar results were obtained by Gado *et al*. (1998b) with goats, Mir and Mir (1994) and Olson *et al*. (1994) with steers and Eramus *et al*. (1992) and Doreau and Jouany (1998) for dairy cows. Kholif and Khorshed (2006) reported an increase in ruminal pH due to yeast culture supplementation; the disagreement of these results with results reported herein may be due to the variation in concentrate: roughage ratio (50:50%) for lactating buffaloes. The variation may also be due to the level of YC supplementation being 20g YC (Ebrahim, 2004) and 20 or 30g YC/h/d (Abdel-Latif, 2005) or due to the variation in animal species (Abdel-Khalek *et al*., 2000) for suckling Friesian calves. They reported pH value to decrease with the addition of yeast culture.

Table (3): Rumen parameters for yearling male Rahmani lambs as affected by live DY supplementation.

Items	Time (hrs)	Treatments		
		Control	5 g /h DY	7.5 g /h DY
pH	0	6.52±.03	6.67±.04	6.66±.15
	3	6.31±.02	6.11±.06	6.13±.11
Ammonia-N mg/100ml	0	26.88±.61	26.49±.21	27.33±.50
	3	32.55±.48^{A}	30.45±.68^{B}	30.49±.69^{B}
Total VFA eq/100ml	0	7.50±.21	8.08±.35	8.19±.31
	3	9.91±.25^{B}	10.79±.23^{A}	11.41±.31^{A}

$^{A, B,}$ values in the same row not sharing the same superscripts are significantly different (P<0.05).

Data in Table (3) also revealed that ruminal ammonia-N concentration at 3-hr post feeding was lower in 5 and 7.5g/h DY-supplemented groups than control group (P<0.05). The results in the present study are in harmony with those reported by El-Shaer (2003) who reported that yeast culture supplementation lead to decrease of ruminal NH_3-N. as compared to control group. Also, Harrison *et al*. (1988), Gado *et al*. (1998b), Metwally *et al*. (2001), Ghorab (2007) and Komonna (2007) came to the same conclusion.

On the other hand, some studies found higher values of ruminal ammonia-N due to yeast culture supplementation (Abdel-Latif, 2005, with Suffolk x Ossimi sheep) and (Shahin *et al*., 2005, for buffalo calves). Also, insignificant differences were found due to yeast culture supplementation (El-Waziry *et al*., 2000; Ahmed and Salah, 2002 and Al-Dabeeb and Ahmed, 2002) in sheep. Giger-Reverdin. *et al.* (2004) found that yeast addition did not have any significant effect on concentrations of volatile fatty acids, ammonia, lactate or soluble carbohydrate in ruminal fluid for dairy goats..The pH was numerically higher for the yeast diet compared to the control. Ruminal buffering (BC) capacity:-

Respective reduction in the ruminal NH_3-N in response to YC supplementation may be due to the increase of ammonia transportation into microbial protein (Harrison *et al*., 1988). Newbold *et al*. (1990) suggested that the reduction in ruminal NH_3-N due to yeast is not due to a reduction in the proteolytic, peptidolytic or deamination activity of rumen microorganisms, but it is more likely to be due to the

increase of bacterial growth. Williams and Newbold (1990) stated that rumen ammonia reduction appears to be the results of increased incorporation of ammonia into microbial protein and it may be the direct result of stimulated microbial activity.

Data in Table (3) also illustrated that the highest value of total VFA was found for 5 and 7.5 g/h DY-supplemented groups than control group (P<0.05). The lowest VFA was found before feeding and increased at 3hr post-feeding Results also indicated that total VFA had inverse relation with ruminal pH being low value before feeding and increased 3hr post-feeding whereas, pH value was high before feeding and declined 3hr post-feeding. Similar results were reported by Al-Dabeeb and Ahmed (2002), Komonna (2007) in sheep and Shahin *et al*. (2005) in buffalo calves. They reported that increasing in VFA concentration at 3hrs post-feeding lead to the decrease observed in pH values. The previous data matches well with that reported by Ahmed and Salah (2002), Al-Dabeeb and Ahmed (2002), Abdel-Latif (2005) and Komonna (2007) in sheep. They reported that higher total VFA were found for supplemented groups with YC as compared with control group. Shahin *et al*. (2005) for buffalo calves came to the same conclusion.

On contrast, El-Shaer (2003) and Ismaiel *et al.* (2010) working with sheep and Gado *et al*. (1998b) with goats showed insignificant differences in total VFA due to yeast culture supplementation. Also, Dawson *et al*. (1990), Callaway and Martin (1997), Kung *et al*. (1997), Putnam *et al*. (1997) and Doreau and Jouany (1998) with large ruminants came to the same conclusion.

Blood components:-

A- ***Late pregnancy period:***

As shown in Table (4) dried yeast supplementation significantly increased (P<0.05) albumin and glucose concentrations, while blood total protein, globulin or A/G ratio are not affected (Table, 4).The significant increase in blood albumin suggested normal status of liver function, since the liver is the main organ of albumin synthesis. This may be means that DY supplementation did not damage or affect the liver function (AST and ALT), whereas, several studies cleared that the normal range of albumin/globulin ratio ranged from 0.8-1.3 in blood serum of sheep (Salem *et al.,* 2000, Komonna, 2007 and Gabr *et al.,* 2008) The obtained results are in accordance with those reported by El-Shaer (2003), Mahrous and Abou-Ammou (2005), Komonna (2007) for sheep, Kholif (2001) for goats. They found that YC supplementation did not affect blood A/G ratio. However**,** Khattab *et al*. (2003) with sheep and Shahin *et al*. (2005) with buffalo calves recorded a decrease in A/G ratio due to YC supplementation. In regarding with the effect of gestation period on protein fractions and glucose content in the blood plasma, Al-Saied *et al*. (1999) in Friesian cows, Abdel-Hafez (2002) and Komonna (2007) in Suffolk x Ossimi ewes and Abdel-Ghani *et al*. (2003) in Egyptian buffaloes. Abdel-Hafez (2002) reported a pre-partum decrease in blood protein fractions while could be attributed to the increase in fetus weight and to an increase in protein breakdown required for gluconeogenesis, while Putnam and Schwab (1994) reported that YC stimulates rumen microbes that altered microbial protein synthesis and increased protein passage as well as protein yield. The obtained results regarding effect of gestation period are in agreement with those reported by Abdel-Ghani *et al*. (2003) who reported a decrease in blood globulin concentration during late pregnancy in buffaloes. However, Komonna (2007) found that YC supplementation had no significant on A/G ratio during pregnancy.

Supplementation of live DY increased (P<0.05) glucose level during late pregnancy period as compared to the control ewes. The present results are in accordance with that obtained by Talha (1996) and Abdel-Khalek *et al*. (2000). The higher glucose level in blood may be related to rapid rate of hydrolysis and absorption of the dietary carbohydrates in alimentary tract. This finding may be related to the effect of YC through activity of amylase that lead to increasing carbohydrates hydrolysis in the small intestine (Williams, 1989). Otherwise, this could be attributed to increasing the activity of cellulolytic bacteria that act on cellulose fibers degradation and thus produced more glucose and increased the glucogenic precursor propionate in rumen or decreased plasma insulin and insulin-glucose ratio leading to an increase in gluconeogenesis (Dawson, 1993).

The average of blood cholesterol concentration and activity of ALT decreased (P<0.05) only in response to the tow levels of DY, in the same time urea concentration (insignificant differences) and activity of AST increased (P<0.05) in response to both levels of DY supplementation, meanwhile blood creatinine concentration was not significantly affected by DY supplementation. Values of AST and ALT were within the normal range and indicated that the animals were generally in a good nutritional status and their livers were in a normal health condition.

The results are in accordance with reported by Komonna (2007) for sheep and Abdel-Khalek *et al*. (2000), El-Ashry *et al*. (2003) and Ragheb *et al*. (2003) for Friesian calves and El-Asrhy *et al*. (2004) for buffalo heifers who found that feeding diets treated with yeast or fungi also resulted in a decrease of cholesterol concentration, which may be attributed to stimulation of bacterial lipids synthesis (Williams, 1989) and / or due to anti-cholesteroleamic effect of YC treatments (Fuller, 1989). On the other hand, the obtained insignificant increase in serum urea-N of

ewes in response to DY supplementation may reflect a tendency for improved N utilization of feed, which agrees with that reported by El-Shaer (2003), Fayed *et al*. (2005) in sheep and Ragheb *et al*. (2003) and Ibrahim *et al*.(2005) with Friesian calves. However, Khattab *et al.*, (2003) and Mahrous and Abu-Ammou, (2005) and Hassan (2009) with sheep and Kholif (2001) with goats found that YC supplementation had no significant effect on urea concentration, which may be due to differences in levels and duration of YC supplementation.

Table (4): Effect of live dried yeast (DY) supplementation on blood constituents of Rahmani ewes during late pregnancy period.

Items	Treatments		
	Control	5 g /h DY	7.5 g /h DY
Total protein (g /dl)	6.60 ±.30	6.62 ±.28	6.70 ±. 14
Albumin (g / dl)	2.94 ±.04^{B}	3.11 ±.05^{AB}	3.31 ±.08^{A}
Globulin (g / dl)	3.36 ±..27	3.51 ±.31	3.39 ±.13
A / G ratio	0.8 ±.05	0.89 ±.09	0.98 ±.05
Glucose (mg / dl)	40.82 ±.72^{B}	44.52±.82^{A}	44.44 ±.83^{A}
Cholesterol (mg/dl)	102.80 ±.92^{A}	93.40±.46^{C}	97.51±. 39^{B}
Urea (mg/dl)	35.72 ±.37	37.66 ±.67	38.05 ±.79
Creatinine (mg/dl)	1.21±. .13	1.39 ±.06	1.37±.04
AST(IU / dl)	37.16 ±.31^{B}	42.50 ±1.12^{A}	44.31±.58^{A}
ALT (IU / dl)	29.31±.36^{A}	28.85±.27^{AB}	28.13±.30^{B}

$^{A, B, C}$ values in the same row not sharing the same superscripts are significantly different (P<0.05).

B- Suckling period:

Data in Table (5) showed that, there were significant differences among experimental groups for plasma total protein (P<0.05) post lambing. Higher values were achieved with DY-supplemented groups than control. No significant effect of DY addition on albumin, globulin concentrations and albumin/globulin ratio. Glucose concentration was significantly affected at (P<0.05) by DY supplementation being higher values were obtained with DY-supplemented groups than of control. It led to an increase in milk lactose synthesis and consequently milk production being increase. AST and ALT activities were within normal range indicating that animals were in a good nutritional status and their livers were in a normal physiological condition. Also, data illustrated that concentration of cholesterol and creatinine was higher for 5 and 7.5 g/h supplemented-groups than control group with any significant differences .Urea concentration followed the same pattern (P<0.05). These results are in accordance with reported by Komonna (2007) and Helal and Abdel-Rahman (2010) and Baiomy (2011) for sheep during milking peiod. El-Badawi *et al.,* (1998) found that higher supplementation levels of YC led to higher (P<0.05) plasma urea-N, while total protein content in the blood was stable and comparable between groups in lactating Baladi goats supplemented with YC at 0,1 and 2 g/kg concentrate feed mixture. On contrast, blood components were not significantly different for grazing dairy ewes (Masek *et al*., 2008).

Table (5): Effect of live dried yeast (DY) supplementation on blood constituents of Rahmani ewes during suckling period.

Items	Treatments		
	Control	5 g /h DY	7.5 g /h DY
Total protein (g / dl)	6.49 ±.26^{B}	7.20 ±.15^{A}	7.35 ±.17^{A}
Albumin (g / dl)	3.18 ±.07	3.32 ±.07	3.37 ±.05
Globulin (g / dl)	3.31 ±.26	3.88 ±.21	3.98 ±.18
A / G ratio	0.96 ±.08	0.86 ±.06	0.85 ±.04
Glucose (mg / dl)	42.85 ±.47^{B}	47.35 ±.71^{A}	47.86 ±.28^{A}
Cholesterol (mg/dl)	103.51 ±1.17	104.59 ±.46	106.21 ±.91
Urea (mg/dl)	36.11 ±.45^{B}	38.88 ±.30^{A}	39.32 ±..81^{A}
Creatinine (mg/dl)	1.16±. .08	1.29 ±.03	1.31±.04
AST(IU / dl)	38.16 ±.33^{C}	43.12 ±.89^{B}	45.66 ±.51^{A}
ALT (IU / dl)	28.92±.38	28.62±.39	28.14±.72

$^{A, B, C}$ values in the same row not sharing the same superscripts are significantly different (P<0.05).

It is interesting to note from data in Tables (4 and 5) that most of blood plasma constituents were decreased during late pregnancy and increased post lambing (suckling period)..For glucose concentration, these results are in accordance with those reported by Abdel-Hafez (2002) for Suffolk x Ossimi ewes reported that blood glucose was high at 90 days after mating and decreased at the last week of pregnancy. These results may be due to high demand for energy especially glucose as a main source of energy during

late pregnancy. Manston and Allen (1981) reported that reduction in blood sugar level in the late pregnancy and 1 - 2 days after parturition indicates a heavy demand for glucose in late gestation and early lactation. Similar results for Egyptian buffaloes, decreasing blood glucose during late pregnancy and increasing in the 3 months postpartum were reported by El-Malky (2007). Salem *et al.* (2002) reported that blood cholesterol concentration was increased till the 2nd month postpartum for lactating buffaloes. In general, blood parameters estimated in this study were within the normal range for blood constituents of small ruminants.

Reproductive parameters:

Data in Table (6) showed that all reproductive traits were similar in the three tested groups and did not affect by DY supplementation. In addition, it could be observed that Kilograms of lambs born / ewes lambed was the highest value in group supplemented with 7.5g/h live DY (2.65) followed by 5g/h live DY-supplemented group (2.42) and then control group(2.30). Also, kilograms of lambs weaned /ewes lambed followed the same pattern. These results are aggrement with obtained by komonna (2007) and Helal and Abdel-Rahman (2010) who reported that supplementation of yeast to ewes diets increased birth weight and weight gain of their offspring. *Saccharomyces cerevisiae* reported to balance the energy and the acid-base metabolism in dairy cattle resulted in a significantly higher milk production (Brydt *et al*., 1995) and (Masek *et al*., 2008 and Helal and Abdel-Rahman ,2010) came to the same conclusion of sheep and increasing milk yield of ewes is an important factor for the production of robust lambs at weaning. Ismaiel *et al.* (2010) reported that yeast culture increased average daily gain of lambs. Dawson (1994) showed that, yeast or yeast culture are rich source of vitamins, enzymes and other important nutrients and co-factors which make them attractive as digestive enhancers as a basic source of nutrients.

Table (6): Effect of live dried yeast (DY) supplementation on some reproductive traits of Rahmani ewes.

Items	Treatments		
	Control	5 g /h DY	7.5 g /h DY
Number of ewes joined with rams	7	7	7
Conception rate, No. (%)	7 (100 %)	7 (100 %)	7 (100 %)
Fertility, ewes lambed/ ewes joined No. (%)	7 (100 %)	7 (100 %)	7 (100 %)
Fecundity, lambs born/ewes joined No. (%)	7 (100 %)	7 (100 %)	7 (100 %)
Lambs born per ewes joined (%)	7 (100 %)	7 (100 %)	7 (100 %)
Prolificacy, lambs born/ewes lambed, No. (%)	7 (100 %)	7 (100 %)	7 (100 %)
Twining frequency, No. (%)	0	0	0
Number of viable lambs at weaning	7	7	7
Reproductive ability (lambs weaned/ewes joined), (%)	100 %	100 %	100 %
Lambs weaned/ewes lambed (%)	100 %	100 %	100 %
Kg. of lambs born per ewe lambed	2.30	2.42	2.65
Kg. of lambs weaned per ewes lambed	12.25	12.95	13.70
Mortality rate of lambs from birth to weaning (%)	0	0	0

Table (7): Effect of live dried yeast supplementation on milk yield and its composition of Rahmani ewes during suckling period

Items	Treatments		
	Control	5 g /h DY	7.5 g /h DY
Daily milk yield (g)	680±11.48	745±13.38	770±12.47
Improvement (%)	-	9.56	13.24
4% fat corrected milk(g)	965.60±17.42^{B}	1086.15±24.87^{A}	1106.71±25.45^{A}
Total solids (%)	18.45±.16^{B}	18.82±.07^{A}	19.12±.07^{A}
Fat (%)	6.80±.11	7.05±.08	6.91±.08
Solids not fat (%)	11.65±.21	11.77±.06	12.21±.09
Protein (%)	5.91±.04^{B}	6.35±.04^{A}	6.43±.07^{A}
Lactose (%)	4.92±.16	4.57±.09	4.89±.07
Ash (%)	0.82±.17	0.85±.08	0.89±.02
Avg. fat yield, g/h/d	46.24±.93^{B}	52.52±1.32^{A}	53.21±1.37^{A}
Avg. Protein, g/h/d	40.18±.62^{B}	47.30±.86^{A}	49.51±1.18^{A}
Avg. Lactose, g/h/d	33.46±1.40^{B}	34.04±.69^{AB}	37.65±.28^{A}

$^{A, B}$ values in the same row not sharing the same superscripts are significantly different (P<0.05).

Milk yield and its composition:

Concerning milk yield expressed as daily milk yield and milk composition were shown in Table (7). Daily milk yield was insignificantly different among treated groups. While, milk yield as 4% fat corrected milk was higher in live DY supplemented groups than those of control group (P<0.05). Live dry yeast supplementation improved daily milk yield by 13.24

and 9.56% for 7.5 and 5g/h live DY supplemented groups as compared to control group. These results could be attributed to increasing nutrients digestbility of the experimental diets with DY addition and may be to improve nutritive values of tested diets. These results are in agreement with those recorded by komonna (2007), Helal and Abdel-Rahman (2010) and Baiomy (2011) who reported that supplementation of yeast culture increased daily milk yield for lactating ewes. Also, similar results were found in dairy cows by Willams *et al.* (1991), Erasmus *et al*. (1992), Strzetelski *et al*. (1996), Allam *et al. (*2001), Abdel-Khalek *et al*. (2002), El-Saadany *et al*. (2002), Abdel-Khalek (2003), Abdel-Ghani *et al*. (2004) and Ghorab (2007) and for lactating buffaloes obtained by Ebrahim (2004) and Marghany *et al.* (2005). On the other hand, yeast culture supplementation had no significant effect on milk yield or 4 % FCM for dairy cows were reported by Soder and Holden (1999) and Dann *et al*., 2000) for dairy cows. The highest (P<0.05) total solids %, milk protein % and average daily yield of fat, protein and lactose (g/h) were obtained by 7.5 g/h DY-supplemented group followed by 5g/h DY-supplemented group and then the lowest values were recorded in control group (Table 7).The increase in milk protein content by probiotic addition may be due to increased ruminal cellulose digestion and stimulation of rumen microbes that cause altering the microbial protein synthesis and increased milk protein yield (Dawson, 1993).

There were insignificant differences among supplemented groups for percentage of solids not fat and fat, lactose and ash. These results are in accordance those reported by komonna (2007) and Helal and Abdel-Rahman (2010) who reported that yeast culture or probiotic supplementation had effect on milk composition lactating ewes. Similar results were reported by Salem *et al.* (2002) using lactating buffaloes, Baiomy (2011) found an opposite trend for dairy sheep.

Lambs growth performance:

Data in Table (8) showed that ewes in DY-supplemented groups had non significant higher values of birth weight as compared with control group. Similarly, weaning weight was higher in the DY supplemented groups than that of control group (P<0.05). The highest significantly total gain and average daily gain at (P<0.05) were achieved with 7.5 g/h DY-supplemented group followed by 5g/h DY-supplemented group and then control group. These results are in accordance with those reported by Ahmed and Salah (2002) and komonna (2007) who found that addition yeast culture for diets of ewes during nursing period resulted in improving its feed utilization and resulted in satisfactory ewe live weight and lamb growth rate. Also, El-Ashry *et al.* (2003), Ali (2005) and Helal and Abdel-Rahman (2010) came to the same conclusion for probiotic or dry yeast supplementation for sheep. On contrast, El-Shaer (2003) reported that, yeast culture supplementation had no significant effect on final body weight and body gain when sheep fed diet containing (2:1 or 1:2) concentrate : berseem hay ratio with or without 0.25 g yeast culture / 10 kg LBW.

Table (8): Effect of feeding the experimental diets on productive performance of Rahmani lambs during suckling period (60 days).

Items	Treatments		
	Control	5 g /h DY	7.5 g /h DY
Birth weight (kg)	2.30±.14	2.42±.11	2.65±.15
Weaning weight (kg)	12.25±.08^{B}	12.95±.07^{B}	13.70±.29^{A}
Total gain, (kg)	9.95±.16^{B}	10.53±.13^{A}	11.05±.40^{A}
Avg. daily gain (g/h/d)	166±2.66^{B}	176±2.17^{A}	184±6.65^{A}

$^{A, B}$ values in the same row not sharing the same superscripts are significantly different (P<0.05).

In conclusion, the findings of this study revealed that, supplementation of live dried yeast (Yea - Sacc 1026) to diets of sheep at levels (5 or 7.5 g/h/d had positive and beneficial effects on enhance digestion and nutritive values, rumen fermentation blood constituents consequently enhance milk yield and composition as well as daily weight gain for lambs.

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