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Productive Performance of Lactating Ewes Fed Diets Supplementing with Dry Yeast and/or Bentonite as Feed Additives

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Abstract: Influence of diets supplementing with dried yeast and/or bentonite of lactating Rahmani ewes on milk yield and its composition, some rumen parameters, some blood constituents, feed efficiency, nitrogen balance and nutrients digestibilities, in addition to the performance of offsprings of lactating ewes were studied for 10 weeks. Twenty lactating Rahmani ewes, being 2-3 years old and weighing on the average 45.8±2.1kg were divided randomly into four similar experimental groups. The control group was fed a basal diet, the second, third and fourth groups were fed basal diet supplemented with dry yeast, bentonite and yeast+bentonite, respectively. Results demonstrated that supplementations enhanced significantly (P<0.05) total dry– matter intake and utilization of the roughage used. Higher values of milk yield, fat corrected milk, fat, protein, lactose and total solids in milk were recorded for animals fed diets supplemented with yeast and/or bentonite comparing with the control group. Supplementing the tested ewe's diets significantly (P<0.05) increased nutrients digestibilities and feeding values in comparison with control. Average daily gain of the offspring's of ewes supplemented groups increased also significantly (P<0.05) compared with those recorded for the control group. It could be concluded that, supplementation of both yeast and/or bentonite to the diets of lactating ewes increased total dry-matter intake, milk yield and its quality as well as, rumen activity, N-balance, nutrient digestion feeding values, blood serum parameters and weight gain of their offsprings.

Key words: Yeast · Bentonite · Nutrients digestibilities · Blood parameters · Lactating ewes and performance

INTRODUCTION

Yeast products have been shown to modify rumen fermentation [1, 2] to stimulate the number and growth of rumen bacteria [3, 4] and to increase the initial rate of forage digestion in the rumen. Inclusion of yeast cultures (YC, *Saccharomyes cerevisiae)* in the diets of ruminants have been shown to alter molar proportions of ruminal volatile fatty acid's "VFA" [5,6], increase nutrient digestibilities[6-10]reduce ruminal NH_3 concentration, shift bacterial populations and increase the number of ruminal bacteria, increase protozoa and alter the flow of N fractions to the duodenum [6,11]. Dietary YC for cows and buffaloes has increased DMI and milk yield [8, 12, 13]. Yeast cultures used as a dietary supplement for dairy cattle for many years is thought [1] to improve rumen function and hence, milk production and feed efficiency by stimulating growth of rumen bacteria, particularly cellulolytic species as well as improve fiber digestibility [1]. Moreover, studies by Kumar *et al.* [14] on buffalo calves showed that addition of yeast culture as a growth promoter, to diets resulted in increasing rumen pH, total bacteria and protozoa culture count, total volatile fatty acids "TVFA's", total N and microbial protein with decreasing ammonia-N concentration and improving digestion of cellulose and DM disappearance.

Much attention recently has been focused on use of supplemented yeast and bentonite to improve ruminant's performance. Piva *et al.* [15], Erasmus *et al.* [4], El-Ashry *et al.* [8] and Allam *et al.* [16] reported that the addition of YC in the diet of dairy cows and buffaloes was beneficial in improving milk production, 4 % FCM and milk fat and milk composition. Moreover, bentonite is one of the common natural clays used in animal diets to improve digestibility of nutrients and daily gain and feed intake [17, 18]. Bentonite can absorb toxic products of digestion and decrease the accumulation of toxic substances in tissues, thus decreasing the incidence of internal

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disorders [19]. Furthermore, the addition of bentonite to the diet can partly equalize the supply of nitrogen to the rumen microorganisms, so, bentonite could be considered as a useful component in the ration [20]. Increasing of milk yield for lactating ewes is an important factor for the production of robust lambs at weaning, therefore, the present study was carried out to investigate the effect of dried yeast and/or bentonite on the milk yield, milk composition, some rumen parameters, some blood parameters, feed conversion, nitrogen balance and nutrients digestibility in addition to improve the performance of offsprings of lactating ewes.

MATERIALS AND METHODS

This study was carried out at the Experimental Station, Faculty of Agriculture, Monofyia University, Egypt. Two feed additives were used in this study, dry yeast and bentonite for improving animal performance.

Animals, Diets and Experimental Design: Twenty lactating Rahmani ewes, being 2-3 years old and weighed on the average 45.8±2.1kg were divided into 4 groups (5 ewes/group) to study the effect of adding dry yeast and / or bentonite in rations, compared with the control group. The feeding trial lasted 10 weeks. The first group (T_1) was kept as a control and fed a basal diet formulated from berseem (3rd cut), wheat straw and concentrate feed mixture (CFM), while the second group (T_2) was fed the basal diet supplemented with 0.5 % dry yeast as part of CFM. The third group (T_3) received the basal diet plus 4 % bentonite of CFM. The fourth group (T_4) received the basal diet supplemented with 0.5 % dry yeast + 4 % bentonite of CFM. The CFM was offered at a rate of 2 % of average live body weight of each group.

The CFM was offered to animals once daily and after animals had consumed it, berseem was offered at equal rate for each group, then wheat straw was fed *ad libitum*. The residues of offered roughage were collected and weighed daily and recorded for each group. Feed consumption was calculated. Intakes of CFM were adjusted biweekly for each group according to changes in body weight to meet the required allowances. Each group was kept in separate shaded pen and adapted for the diet for 7 days. Fresh water was available throughout the experimental period. Ewes and their offsprings were weighed at the beginning of the experiment and biweekly till the end of the experiment. During lactation, all ewes were hand milked biweekly which milked after removing them away from their offspring 24 hours before milking to determine the total milk yield per day and milk composition for each group.

Digestibility and N-balance Trials: Four digestibility trials were carried out using three adult Rahmani rams weighing about 47 kg to determine nutrients digestibility and N- balance. Animals were left in metabolic cages for 21 days, 14 days for adaptation and 7 days for collection period. Samples of rumen fluid were collected, using stomach tube. Samples were withdrawn just before morning diet and at 3 and 6 hours post feeding. These samples were strained through two layers of cheese cloth and were immediately used for determination of ruimnal pH and ammonia nitrogen (NH_3-N) concentration. The pH values were measured using a digital pH meter. Strained rumen liquor samples were stored in glass bottles with 3 drops of toluene and a thin layer of paraffin oil just to cover the surface to stop microbial activity and to prevent volatilization and then samples were frozen for VFA'S determination.

Samples:

- **Feedstuffs:** Samples of feedstuffs were subjected in duplicate to determine the proximate analyses (DM, CP, CF, EE and ash) according to AOAC [21] and NFE values were calculated by difference.

Table 1: Chemical composition (%) of involved ingredients and concentrate feed mixture (DM-basis)

Item	DM	OM	CP	CF	EE	NFE	ASH
Yellow corn	88.20	97.70	9.30	0.82	4.33	82.80	2.30
UCSM*	92.10	95.20	28.31	24.61	4.83	37.46	4.81
Wheat bran	86.55	93.65	16.11	10.40	3.56	63.59	6.35
Berseem	12.15	87.35	16.40	27.15	2.95	40.85	12.65
Wheat straw	88.55	83.80	2.65	35.41	1.56	44.19	16.20
CFM** composition	86.33	94.28	13.00	6.06	4.50	70.72	5.72

** Composition of concentrate feed mixture (yellow corn 67.5%, undecorticated cottonseed meal (UCSM*) 15%, wheat bran 15%, limestone 1.5%, common salt 0.5%, mineral premix 0.5%)

- **Milk Samples:** Ewes were hand milked in all experimental groups and milk yield was recorded. The 40.9g/kg fat corrected milk yield was calculated using the formula of Gaines and Overman [22]. Individual milk sample of each animal was taken, analyzed for total protein, fat and total solids as described by AOAC [21], while lactose content was measured according IDF [23].

- **Blood Plasma Sampling and Analysis:** Blood samples were collected from the jugular vein using (10ml) glass tubes containing sodium EDTA, from all experimental animals at monthly intervals. Samples were centrifuged at 4000 rpm for 15-min. to obtain plasma, which was stored at -20°C until analyses. Blood plasma was tested for total protein and albumin according to Doumas and Biggs [24]. Plasma globulin was calculated by difference. Albumin /Globulin ratio was also calculated. Urea nitrogen was estimated using kits supplied by Biocon Egypt.

- **Rumen Liquor Samples:** Rumenal liquor was collected from each animal in clean and sterile flask by using clean and sterile stomach tube. Thirty ml of the ruminal fluid were drawn aseptically into clean and sterile vials to be used for bacteriological examination immediately after collection. The colony forming units/ml of the ruminal liquor was carried out by standard plate techniques [25].

Analytical Methods: Dry matter (DM), crude fiber (CF), crude protein (CP), ether extract (EE) and ash of feed and feces, as well as urinary N were determined according to AOAC [21] procedures. TVFA's were determined by steam distillation method according to Warner [26]. Ammonia nitrogen was determined in the filtered rumen liquor (as mg %) according to Abou-Akkada and Osman [27].

Statistical Analysis: Data were subjected to the statistical analysis [28]. Duncan's multiple range tests [29] was used for testing the significant differences among groups.

RESULTS AND DISCUSSION

Nutrient Digestibility and Feeding Value: The results of nutrients digestibility and feeding values of experimental rations are shown in Table 2. Results showed a significant (P<0.05) on and nutrients digestibilities and feeding values for experiential groups fed diets supplemented with dried yeast and /or bentonite. The tested rations increased significantly digestion coefficients of all nutrients and nutritive values for T2, T3 and T4 as compared with control group. The differences among supplemented rations were insignificant. These results are in accordance with those found by Saleh *et al.*[17], Salem *et al.* [18], Abdel-Mawla *et al.*, [30], Abdel-Baki *et al.* [31], Gabr *et al.* [32] and EI-Tahan *et al.* [33],who reported that supplementing bentonite to diets significantly (P<0.05) improved nutrients digestibility and nutritive value.

This increase in digestibility may be due to the increase in the retention time and a decrease in ruminal turnover rate [34].On the other hand, El-Ashry *et al.* [8], Allam *et al.* [16] and Ragheb *et al.* [35] reported that supplemented yeast to rations improving all nutrient digestibilities. The improvement of protein digestibility may be due to the stimulation of rumen protelytic bacteria [11]. Moreover, improving CF digestibility may be attributed to increase the number of rumen cellulolytic bacteria due to yeast supplementation [36]. When bentonite was added to tested diets, digestabilities of CP, CF and EE increase and ruminal turnover rate decrease [37].

Results in Table 3 showed that feeding values (TDN and DCP) of supplemented rations were increased significantly compared to control group. The highest value was recorded with T_4 followed by T_2 and T_3, while the lowest one was recorded with control group. These results were in accordance with those found by Saleh *et al.* [17], Salem *et al.* [18] and El Tahan *et al.* [33], who reported that TDN and DCP were significantly (P<0.05) increased by adding bentonite when compared to the control group. Furthermore, El-Ashry *et al.* [8] reported that supplemented diets with yeast increased (P<0.05) feeding value of the rations.

Animal Performance:

- **Dry Matter Intake:** The DMI of different groups are presented in Table 3. There were significant differences, (P<0.05) in the total dry matter intake among different experimental animals. Higher values were recorded with the groups fed the diets supplemented with dried yeast and /or bentonite (T_2, T3 and T_4) compared to the control group. Groups T_2, T3 and T_4 consumed more DM by 4.35%, 5.58% and 5.58% than control group respectively. The enhanced intake is most likely due to an improvement of the rate of breakdown of feedstuffs in the rumen.

Table 2: Nutrients digestibilities and feeding values of the experimental rations

	Treatments			
Item	T1	T2	T3	T4
Apparent digestibility%				
DM	64.93±2.44^{b}	71.35±1.65^{a}	69.85±1.15^{a}	72.15±1.03^{a}
OM	63.06± 1.54^{b}	74.85±1.28^{a}	72.25±1.11^{a}	75.35±1.55^{a}
CP	62.84±2.35^{b}	72.70±1.57^{a}	71.65±1.1^{a}	75.75±1.07^{a}
CF	55.85±1.45^{b}	66.64±1.2^{a}	66.35±1.4^{a}	68.95±1.35^{a}
EE	69.63±1.09^{b}	74.82±1.55^{a}	72.75±1.01^{a}	76.25±1.00^{a}
NFE	71.65±1.75^{b}	77.84±2.08^{a}	76.45±1.60^{a}	79.55±1.40^{a}
Feeding values %				
TDN	61.42±1.15^{b}	71.17±1.33^{a}	68.88±1.05^{a}	72.40±1.12^{a}
DCP	7.14±1.06^{b}	7.69±1.00^{a}	7.30±0.7^{a}	7.50±0.8^{a}

- Each value represents a mean of 3 samples.

Tl = Control, T2 = Dry yeast, T3 = Bentonite and T4 = Dry yeast + Bentonite

a, b, c Means at the same column with different superscripts are significantly different at (P<0.05).

Table 3: Effect of supplementing lactating ewe's rations with dried yeast and/or bentonite on the dry matter intake (DMI)

	Experimental group			
Item	(T1)	(T2)	(T3)	(T4)
Total DM intake (kg/ head/ day)	2.20^{b*}	2.30^{a}	2.33^{a}	2.33^{a}
CFM(kg/ head/ day)	0.990	0.955	1.000	1.000
Berseem (kg/ head/ day)	0.625	0.643	0.645	0.645
Wheat straw (kg/ head/ day)	0.582	0.655	0.680	0.687

Tl = Control, T2 = Dry yeast, T3 = Bentonite and T4 = Dry yeast + Bentonite

Figures in the same row having the same superscripts are not significantly different (P<0.05)

One potential benefit of the addition of yeast or /and bentonite to lactating ewe diets is enhancement of DMI. This benefit was demonstrated clearly in this study, the explanation for this is that, as yeast added to the rations and it provides stimulatory actors to rumen cellulolytic bacteria as reported by Erasmus *et al.* [4], Williams *et al.* [11] and Piva *et al.* [15]. Although the differences among supplemented rations groups were not significant, such results agreed well with the remarks made by EI-Ashry *et al.* [8, 9], Adams *et al.* [12], Allam *et al.* [16], Saleh *et al.* [17], Salem *et al.* [18], Robinson and Garret [38] and Putnam *et al.* [39], who reported that there was a significant improvement in DMI when yeast culture was given to lactating animals. However, Aramel and Kent [40] found no effect of YC supplementation on DMI. Also, these results are in agreement with those obtained by Gabr *et al.* [32] and EL-Tahan *et al.* [33] when adding different levels of bentonite to growing lambs.

Milk Yield and Composition: Effect of supplementing rations on milk yield and its composition is presented in Table 4. There were significant (P<0.05) differences in the amount of milk yield, milk fat and fat corrected milk (FCM) (Table 4) among different treatments and the higher values of milk yield were recorded with animals fed diets supplemented with dry yeast and /or bentonite in comparison with control group. The highest value was recorded with T4. In other words, T4 recorded higher milk yield than those of T_1, T_2 and T_3 by 15.38, 4.17 and 7.14%, respectively. The relative improvement in milk production of T2 and T4 could be attributed to the fact that supplementation with yeast may act as a source of B-vitamins, which may occasionally be beneficial. Moreover, the microbial protein flow from the rumen was increased with adding of yeast to the diet [41]. These results are in agreement with those reported by Adams *et al.* [12], Dann *et al.* [13], Piva *et al.* [15], Allam *et al.* [16], Robinson and Garrett [38], Yousef *et al.* [42] and Abo-El-Nor and Kholif [43], who reported that production of milk, FCM and milk fat was increased significantly by dietary yeast culture supplement. El-Ashry *et al.* [8] and Abdel-Khalek [44], showed that milk production, milk protein and milk fat yields were significantly (P<0.05) affected by YC supplementation. On the other hand, these results are

Table 4: Effect of supplementing lactating ewe's rations with dried yeast and/or bentonite on the milk yield and composition and feed efficiency

	Experimental groups			
Item	Tl	T2	T3	T4
Milk yield (g/h/d):	650±20[b]	720±14[a]	700±10[a]	750±7[a]
4% fat corrected milk	954.2[b]	1109.88[a]	1055.95[a]	1126.88[a]
Total solids (g/h/d)	131.63±1.7[c]	147.10±2.8[b]	144.20±1.9[b]	161.70±1.05[a]
Fat (g/h/d)	46.28±0.9[b]	52.56±1.02[a]	50.26±1.01[a]	55.13±0.8[a]
Solid non fat (g/h/d)	86.65	95.18	93.31	100.13
Total protein (g/h/d)	46.02±1.03	51.70±0.8	50.12±1.2	54.600±1.1
Lactose (g/h/d)	29.45±1.10	33.34±1.03	32.97±1.4	35.7±1.2
Milk composition (%)				
Total solid	20.25±0.19	20.43±12	20.60±0.20	21.56±0.10
Fat	7.12±0.17	7.30±15	7.18±0.11	7.35±0.05
Solid non fat	13.33	13.22	13.33	13.35
Protein	7.08±0.18	7.18±0.15	7.16±0.21	7.28±0.08
Lactose	4.53±0.17	4.63±0.12	4.71±0.17	4.76±0.12
Feed efficiency				
Milk kg/ DMI kg.	0.339	0.318	0.333	0.310
FCM, kg/DMI kg	0.434	0483	0.453	0.484

Tl = Control, T2 = Dry yeast, T3 = Bentonite and T4 = Dry yeast + Bentonite

* Figures in the same row having the same superscripts are not significantly different (P<0.05)

supported with findings of Saleh *et al.* [17] on buffaloes, Abdel-Baki *et al.* [31] on cows and Abdel-Mawla *et al.* [30] and Salem and El-Shewy [45] on goats, who found that the ration supplemented with bentonite improved milk production and its composition. Baldi *et al.* [46] concluded that bentonite significantly increased molar proportion of butyrate which can be used as a precursor for fat synthesis.

Yield of protein and lactose has been affected by ration's supplementing with yeast or/and bentonite but the differences among treatments were insignificant compared to control group, however supplementation of rations had significant effect (P<0.05) on total solids and fat yield compared with control group. The highest values were recorded with T_4 followed by $T_2$and $T_3$and the lowest one was recorded with control group. These results came in line with those obtained by Saleh *et al.* [17], Abdel-Baki *et al.* [31] and Abo-El-Nor and Kholif [44], who reported that differences in SNF and protein percent of cow's milk fed ration supplemented with yeast or bentonite were not significant. The increase in milk protein content by probiotics supplementation may be due to stimulation of rumen microbes that cause altering the microbial protein synthesis and increased protein yield in the milk [6, 47].

Ewes fed the experimental rations supplemented with bentonite and /or dried yeast tended to have the better-feed efficiency calculated as milk yield/DMI and 4% FCM/DML. Feed efficiency was higher in supplemented groups compared to the control one. Such results agreed well with the remarks made by El-Ashry *et al.* [8] who indicating that feed conversion were improved by adding different kinds of yeast to buffalo's rations and Abd El-Baki *et al.* [31] who reported that feed conversion was improved by adding Tafla clay to cows rations.

Rumen Parameters: As shown in Table 5, the ruminal pH decreased insignificantly (P>0.05) by adding bentonite to the rations, but it increased by adding yeast to the rations compared to control one at 3 and 6 hrs post feeding. The pH mean values were similar in the different treatments. These results are in accordance with those found by Abd EL-Baki *et al.* [31] who reported that ruminal pH values significantly increased by adding clay Tafla at 3 and 6 hrs posts feeding than control group. Khattab *et al.* [48] found that Yea-Sacc and Lacto -Sacc had lower pH at different times compared to control. This can be attributed to fermentation process by the rumen microorganisms, which took place on the soluble carbohydrate.

No significant differences were observed for NH_3-N concentration among treatments at 3 and 6 hrs post feeding (Table 5). Values of T2 and T3 were lower than that of the control, but NH_3-N concentration of T4 was similar to Tl (control group). These results are in agreement with the findings of Erasmus *et al.* [4], Newboid [5], Hanafy [7], Saleh *et al.* [17], Salem *et al.* [18],

Table 5: Effect of supplementing lactating ewe's rations with dried yeast and/or bentonite on rumen liquor parameters

	pH time hour				TVFA's (meq/100 ml) time hour				NH3-N (mg/100 ml) time hour			
Groups	0	3	6	Av.	0	3	6	Av.	0	3	6	Av.
T1	6.59	6.15	6.35	6.63	8.15	9.82	8.45	8.81^{b}	18.62	31.66	22.15	24.14
T2	6.63	6.45	6.55	6.54	9.29	10.95	9.92	10.05^{a}	19.95	30.16	21.35	23.82
T3	6.65	6.05	6.25	6.34	8.95	10.86	9.55	9.77^{a}	19.33	30.25	20.05	23.21
T4	6.71	6.45	6.66	6.61	9.25	11.66	9.65	10.19^{a}	19.85	32.05	22.14	24.68

Tl = Control, T2 = Dry yeast, T3 = Bentonite and T4 = Dry yeast + Bentonite

a, b, c Means at the same column with different superscripts are significantly different at (P<0.05)

Abd-El-Baki *et al.* [31] and El-Saadany *et al.* [49]. Lower ammonia concentration with bentonite supplementation may be due to the ability of bentonite to absorb ammonia nitrogen from rumen fluid and to release it back when the concentration falls. Khattab *et al.* [48] reported that values of NH_3-N concentration of yeast treatments were lower than control. The reduction in NH_3-N of yeast treatments may be attributed to the inhibitory effect of growth promoters on proteolysis, amino acid determination and ruminal urease activity. Furthermore, Williams *et al.* [41] reported that the reduction of NH_3-N concentration in the rumen appear to be the result of increased incorporation of ammonia into microbial protein and may be the direct result of stimulated microbial activity.

Total volatile fatty acids (TVFA's) concentrations were found to be significantly higher in treated groups (T_2 T3 and T_4) than Tl (control group). Similar results were recorded by Salem *et al.* [18] and Abd El-Baki *et al.* [31]. Higher TVFA's concentration due to bentonite supplementation may be attributed to the ability of bentonite to improve the nutrients digestibility within rumen [37]. On the other hand, Khattab *et al.* [48] found that the treatments of Lacto-Sacc showed higher ruminal TVFA's concentration compared with the control group.

Nitrogen Balance: Nitrogen balance of ram lambs fed on the experimental rations is shown in Table 6. The differences among supplemental rations and control one were significantly (P<0.05). Higher value was obtained with supplemented rations compared to control group, this may be attributed to the improvement of CP digestibility.

Such results were agreed by with that reported by Allam *et al.* [8] and EI-Ashry *et al.* [9] (supplemented rations with yeast) and Abd El-Baki *et al.* [31] (supplemented rations with bentonite).

Serum Blood Parameters: Concentration of serum total protein (TP) and globulin (GL) tended to be higher but not significant through the supplemented treated groups than the control, however level of albumin (AL) was significantly (P<0.05) higher in supplemented treated groups than control group. On the other hand, TP and GL concentrations in the bentonite group (T3) were not affected compared to control group versus the effect of dry yeast (T2 and T4) compared to Tl and T3. Blood serum parameters were within the normal range in supplemented treated groups and control. Serum urea nitrogen tended to be similar in all groups, however the lowest value was recorded with T3 (bentonite group). The present blood parameters of supplemented treated groups as compared to the control may indicate the beneficial effect of the supplements on ewe's metabolism. Similar results are obtained by El-Ashry *et al.* [8], Salem *et al.* [18], Abdel Mawla *et al.* [30] and Ragheb *et al.* [35].

Offspring Performance: The results of lambs performance nursed from treated ewes are shown in Table 8. There were significant (P<0.05) differences in the average daily gain between different lambs groups and the higher values of lambs daily gain were recorded with supplemented group (182,178 and 195 g/h/day for T2,T3 and T4, respectively) in comparison with control group (162 g/h/day). Final weight of lambs received yeast or bentonite was similar. On the other hand, offsprings of supplemented ewe groups were heavier (19.95, 18.96 and 18.54 kg for T4, T3 and T2, respectively) relative to the control group (17.24) at the end of experimental period. Weight gain throughout the whole experimental period and average daily gain followed the same trend. The increase in the daily gain of offspring's resulting from supplemented groups compared to that in control may be due to the higher milk yield and its content from total solids, total protein and milk fat. The yeast and/or bentonite incorporated into the ewe's feed, have a direct effects on the ewe and indirect effects on the lambs. These results agree with those reported by Abou'l Ella *et al.* [51].

Table 6: Feed intake (g DM/h/day), nitrogen utilization of ram lambs fed the experimental diets supplemented with dry yeast and/or bentonite

	Experimental groups			
Item	T1	T2	T3	T4
Feed intake, g DM/ head/ day:				
CFM	580	600	580	600
Berseem	125	125	125	125
Wheat straw	175	275	320	360
Total feed intake	880	1000	1025	1085
N-intake, gm / day	17.08±0.8	16.93±0.5	17.12±1.01	17.29±0.9
Fecal nitrogen (g/h/d)	4.52±1.03	4.14±0.8	4.55±0.6	4.22±05
N-digested, gm / day	12.56±1.2	12.79±0.9	12.57±1.2	13.07±1.1
N- Urinary, gm / day	6.62±0.9	6.50±0.8	6.56±0.9	6.50±1.2
N- Balance, gm / day	5.94±0.8^{b}	6.29±0.6^{a}	6.01±0.4^{a}	6.57±0.7^{a}
N- retention %				
** Protein productive value	34.78±1.1	37.15±1.10	35.11±1.01	37.97±0.8
Absorbed N.	47.52±1.3	49.18±0.9	47.81±1.0	50.27±0.7

Tl = Control, T2 = Dry yeast, T3 = Bentonite and T4 = Dry yeast + Bentonite

a, b, c Means at the same row with different superscripts are significantly different at (P<0.05),

$$\text{**Protein productive value (PPV)} = \frac{\text{N- Retained}}{\text{N-Intake}} \times 100 \quad [50]$$

Table 7: Effect of supplementing lactating ewe's rations with dried yeast and/or bentonite on serum proteins and urea

	Treatments			
Item	T1	T2	T3	T4
T.P.(g/100 ml)	6.10±0.3	6.61±0.7	6.32±0.4	6.64±0.8
AL.(g/100 ml)	3.15±0.2^{b}	3.54±0.09^{a}	3.55±0.06^{a}	3.35±0.04^{a}
GL.(g/100 ml)	2.95±0.5	3.07±0.2	2.77±0.4	3.29±0.03
AL/GL ratio	1.08	1.15	1.28	1.02
Urea(mg/100 ml)	24.80±1.2	25.70±1.03	22.75±1.01	25.65±1.1

Tl = Control, T2 = Dry yeast, T3 = Bentonite and T4 = Dry yeast + Bentonite

a, b, c Means at the same column with different superscripts are significantly different at (P<0.05)

Table 8: Effect of supplementing lactating ewe's rations with dried yeast and/or bentonite on the performance of their offsprings

	Experimental group			
Item	Control	Dry yeast	Bentonite	DY+Bentonite
No of offsprings	5	5	5	5
Initial weight (kg)	5.9±0.42	5.8±0.56	6.5±0.39	6.30±0.16
Final weight'(kg)	17.24±0.52	18.54±045	18.96±0.29	19.95±0.35
Total gain (kg)	11.34±1.3^{b}	12.74±1.5^{a}	12.46±0.9^{a}	13.65±1.05^{a}
Average daily gain (g)	162±7.5^{b}	182±7.15^{a}	178±6.83^{a}	195±5.75^{a}

a, b, c Means at the same column with different superscripts are significantly different at (P<0.05)

CONCLUSION

A supplement of 0.5% dry yeast and/or 4 % bentonite of CFM could be recommended to be included in diets of lactating ewes and that may improve the nutrients digestibility, feed efficiency and enhance milk yield and its quality as well as weight gain of offsprings.

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