UTILIZATION OF *SACCHAROMYCES CEREVISIAE* SUPPLEMENTATION FOR FEEDING GOATS IN SOUTH SINAI.

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SUMMARY

Eighteen Baladi male kids in 3 groups were used in to study the effect of *Saccharomyces cerevisiae* supplementation either in the form of dried or enriched with selenium on animal growth, nutrient digestibility, some blood and rumen metabolites in addition to some minerals. The first group (T1) was fed on the control ration without additives, while the other two groups were received the control ration plus either 2.5 g/h/d of dried yeast (T2) or selenium enriched yeast (T3), respectively.

The present results showed that dried yeast or selenium enriched yeast additives did not affect DMI, body weight changes. On other hand dried yeast or selenium enriched yeast supplementation had improved the nutrients digestibility coefficient of DM, OM, CP, EE, CF, NFE, NDF, ADF, ADL, hemicellulose and cellulose compared with control group. Supplementation of 2.5 gm/h/d selenium enriched yeast (T3) to kids rations increased (P<0.01) CP, EE and CF digestibility coefficients compared to. Groups T2 and T3 had higher digestion coefficients of NDF, ADF, ADL, Hemicellulose and cellulose than those of control group. There were significant differences among the three tested groups, in TDN and DCP % of DMI. Nitrogen balance values were the highest in animals fed on dried yeast (T2) with differences being no significant among experimental. Likewise, all ruminal fluid parameters were the best for (T3) group than those fed (T2) and (T1) also, animal fed T3 diet, increased rate of passage and decreased retention time, than those fed (T2) and (T1) respectively.

Elevated levels of blood creatinine and liver enzymes (GOT, GPT) as well as blood minerals (P, Ca, Se, Zn and Fe) were recorded in animals supplemented with *Saccharomyces cerevisiae* either in dried form or selenized yeast while blood urea and copper were decreased. It is concluded that rations supplemented with yeast or selenized yeast improved digestibility of nutrients, nutritive value nitrogen balance, rumen parameters and some of blood parameters.

Keywords: *kids, yeast, selenium enriched yeast, rumen activity, digestibility, Rumen and blood metabolites.*

INTRODUCTION

Yeast products have been demonstrated to be useful in improving nitrogen metabolism in ruminants and horses presumably by enhancing fiber digestibility. Therefore, yeast supplements may have the ability to stimulate digestion and aid in maintaining microbial equilibrium in the gut of young animal. In addition, enzymes, vitamins and other nutrients or growth factors changes in the microflora, due to either yeast cell wall components or a direct of the live yeast could reduce pathogenic bacteria, toxic metabolites, subsequently improving animal health, and growth performance (Anderson *et al.*, 1999).

Selenium can be supplemented to cattle diets in either inorganic (usually sodium salts of selenite or selenate) or organic forms (Se-yeast). Cattle fed selenium yeast usually have higher concentrations of selenium in whole blood, serum or plasma than do those fed inorganic se (Ortman and Pehrson, 1999 and Gunter *et al.*, 2003).

The objective of this study was to evaluate the effect of yeast or selenized enriched yeast supplementation on feed digestibility, nutritive value, growth performance, nitrogen balance and some blood and rumen metabolites of kids.

MATERIALS AND METHODS

This study was carried out at Ras Sudr research station in south Sinai governorate belongs to the Desert Research Center.

1. Microorganisms:

Dried yeast and selenium enriched yeast *(Saccharomyces cerevisiae)* F-25 with high selenium content) was obtained from Microbial chemistry lab, National Research Center, Dokki, Giza, Egypt. The cultures were maintained on malt agar media.

2. Feeding and digestibility trials:

Eighteen male Baladi kids four months old with initial live body weight of 11.91± 1.6 Kg were divided into three groups. Six animals of each experimental group, in complete random design experiment for 180 days.

The control ration containing 60 % concentrate feed mixture (CFM) (25% cotton seed, 25% yellow corn, 30% wheat bran, 10% rice bran,3% limestone, 1% common salt and 6% molasses) and 40% berseem hay (on dry matter basis). The experimental rations used were:

(T1): control ration: 60 % concentrate feed mixture (CFM) + 40%barseem hay.

(T2): control ration + 2.5g/head/day of dried yeast (*Saccharomyces cerevisiae*).

(T3): control ration + 2.5 g /head/day of selenium enriched yeast (SEY).

The chemical composition of rations is shown in Table (1). The offered feeds were assessed to cover the requirement for each animal (Kearl, 1982). The CFM for each animal group was offered once daily at 9.00 am, while berseem hay at 2.00 pm, and residues were weighed the next morning before feeding.

Table (1): Chemical composition of experimental feed rations.

	Experimental groups			
Item	T_1	T_2	T_3	BH
DM	89.66	89.23	89.55	88.86
Ash	4.56	4.84	4.99	14.14
OM	95.44	95.16	95.01	85.86
CP	14.20	14.59	14.85	12.25
EE	3.36	3.0	3.26	1.69
CF	8.14	8.225	8.045	28.65
NFE	69.74	69.35	68.86	43.27
Fiber constituents %				
NDF	52.75	53.82	54.46	58
ADF	9.78	9.40	9.26	43.15
ADL	4.65	4.45	3.40	13.45
Cellulose	5.22	4.95	5.86	29.97
Hemicellulose	42.97	44.42	45.20	14.85

T_1: Concentrate feed mixture (CFM) + Barseem hay (BH) (control).
T_2: CFM + 2.5g yeast + BH
T_3: CFM + 2.5g selenized yeast + BH

Water was available for kids all time. Amount of offered and refused were recorded to estimate the actual feed intake for each group.

Immediately at the end of the feeding trial digestibility and nitrogen balance, trials were conducted using four animals chosen randomly from each group. Animals were placed individually in metabolism cages for 21 day of which the first 14 days were a preliminary period, while the last 7days were the collection period. During the collection period, feed intake, total feces weight and urine volume were recorded and sampled daily. Fecal samples were dried at 60 c° for 48 hours, feed and fecal samples were ground through 1 mm screen on a willy mill grinder and were analyzed for chemical composition according to A.O.A.C (1999).

Cell wall constituents (neutral detergent fiber, NDF, acid detergent fiber, ADF and acid detergent lignin, ADL) were determined according to Van Soest *et al.* (1991). Hemicelluloses and cellulose were calculated by the difference between NDF and ADF for hemicelluloses, ADF, and ADL for cellulose.

At the end of the collection period, ruminal fluid samples were obtained from each animal by a stomach tube at zero, 3 and 6 hours post feeding. Blood samples were collected from Jugular vein at zero and 6 hours after feeding. Rumen liquor samples were analyzed for total volatile fatty acid (Warner, 1964), ammonia nitrogen (NH_3-N), total nitrogen (TN), non-protein nitrogen (NPN) and true protein nitrogen (TP) were determined according to A.O.A.C (1999). Blood samples were analyzed for blood urea nitrogen (Patton and Crouch, 1977), Glutamic Pyruvate Transaminase (GPT) and Glutamic Oxaloacetic Transaminase (GOT) (Reitman and Frankle, 1957). Serum creatinine (Jaffe, 1986). calcium(ca), phosphorus (P), selenium (se), zinc (Zn), iron (Fe) and copper (cu) in serum were analyzed using ICAP (inductively coupled argon plasma ICAP 6500 duo, thermo scientific England 1000 mg/L multi-elements certified standard solution, Merck, Germany was used as stock solution for instrument standardization).

3. Rate of Passage

The passage kinetics were carried out on 12 randomly animals, 4 per each group. A single dose of 5 grams chromium oxide (Cr_2O_3) was given to each animal (5 grams of Cr_2O_3 was dissolved in 250 ml distilled water and drenched to animal once at morning before feces collection). Before feeding on the second day of the digestibility trial, in fecal samples (25 grams) for the passage rate were collected at 6, 9, 12, 21, 30, 39, 48, 60, 72, 96 and 120 hrs to calculate the rate of passage (k1) by fecal marker concentration curves, according to Grovum and Williams (1973). Fecal samples were dried and preserved for Cr analysis, by (ICAP)

Concentration of Cr in digestive tract sections and feces was determined by (ICAP) after digestion of 0.2g DM in 15 ml of a 5:1 mixture of Nitric (0.6 v/v) and Perchloric (0.7 v/v) acids according to Devega and Poppi (1997).

Statistical analysis:

Data were subjected to the statistical analysis of (SAS, 2000). Duncan's multiple range tests (1955) was used for testing the significant differences between means.

RESULTS AND DISCUSSION

Wight change and daily gain estimated during the experimental of period (180 days) are shown in Table (2). Average daily gain (ADG) was found to be of a descending order being higher for T3 group followed by T2 and T1 groups, this result may be due to that low values of average daily gain may be related to decrease the ADG of most animals in South Sinai (Ahlam *et al.* (2011)

The present results are in agreement with El-Ashry *et al.* (2001) and Khalifa *et al.* (2001) they concluded that yeast culture supplementation with bakery yeast resulted in increasing average daily gain which might be related to its effect on microbial efficiency and organic matter digestibility. Likewise, El-Ayouty *et al.* (1991) and Gabryszuk and Klewiec (2002) mentioned that selenium supplementation might improve growth rate in growing Friesian calves.

Table (2): Body weight changes and daily gain of kids fed the experimental rations.

	Experimental groups			
Item	T_1	T_2	T_3	± SE
number of animals	6	6	6	-
Initial body weight, Kg	11.75	11.63	12.37	±1.59
Final body weight, Kg	17.50	18.25	19.62	±1.53
Total body weight gain	5.75	6.63	7.25	±0.680
Average daily gain, g/head	31.94	36.83	40.27	±3.99
% of initial body weight	48.93	57.00	58.61	-

Results of dry matter intake (DMI) are presented in Table (3). It is clear that total dry matter intake (TDMI) was relatively similar (37.7, 38.8 and 35.7g/Kg BW) among the different experimental groups,

respectively with differences being insignificant. The present results were consistent with those of several studies, i.e., El Ashry *et al.* (2003) and Aboul Ella (2007).

Table (3): Average daily feed intake, digestion coefficients and nutritive value of kids fed the experimental rations

Item	Experimental groups			
	T_1	T_2	T_3	± SE
No. of animals	4	4	4	
Dry matter intake g/Kg BW				
concentrate	23.93	24.05	22.01	± 1.20
Hay	13.72	14.73	13.66	± 0.652
Total	37.65	38.78	35.67	± 1.83
Cp intake (g/Kg BW)	5.08	5.31	4.94	± 0.255
Drinking water intake				
ml/head	1996.5	2105.6	2056.3	± 105.08
ml/Kg BW	121.28	117.56	106.13	± 8.44
ml/g DMI	3.22	3.03	2.97	± 0.157
Digestion coefficient				
DM	59.69	62.56	63.46	± 1.33
OM	60.15	63.39	64.42	± 1.31
CP	57.62^{b}	61.97^{a}	62.59^{a}	± 0.939
EE	60.46^{b}	65.22^{a}	67.73^{a}	± 0.846
CF	52.32^{c}	61.79^{b}	64.68^{a}	± 0.743
NFE	58.79^{b}	63.17^{a}	64.52^{a}	± 1.79
NDF	48.59^{b}	53.42^{ab}	54.59^{a}	± 1.56
ADF	24.34^{b}	32.39^{a}	34.91^{a}	± 1.27
ADL	22.59	23.35	24.63	± 0.873
Hemicellulose	63.88	67.78	67.81	± 3.24
Cellulose	28.51^{b}	37.80^{a}	42.83^{a}	± 2.14
Nutritive value				
TDN (g/Kg BW)	22.58	25.44	24.05	± 0.757
TDN % of DMI	59.97^{b}	$65.60.^{a}$	67.42^{a}	± 1.17
DCP (g/Kg BW)	2.85^{b}	3.25^{a}	3.15^{ab}	± 0.120
DCP % of DMI	7.59^{c}	8.39^{b}	8.824^{a}	± 0.121

a, b, c Means at the same raw with different superscripts are significantly different (P<0.05), (P<0.01)

Water intake of different experimental treatments did not differ significantly, with values being 3.22, 3.03 and 2.97 ml/g DMI for T1, T2 and T3 groups, respectively. Control group (T1) had the higher water intake (estimated either as

1. Chemical composition of rations:

Results of the proximate chemical analysis of the experimental rations fed to kids are presented in Table (1). The results showed that the DM, ash, OM, CP, EE, NFE and fiber constituent contents were almost similar for T1, T2 and T3 groups. These results were in accordance with those results reported by El-Shaer (2003) and El-Ayek *et al.* (2009).

2. Body weight and dry matter intake

Mean values of body (ml/kg BW) or as ml/g DMI) followed by T2 and T3 groups. Similar results were obtained by Aziz (2004), who showed that water intake either expressed as ml/Kg BW or ml/g/DMI

were not affected by yeast supplementation to the rations. He also added that addition of yeast culture to the rations of lamb decreased water intake expressed as ml/Kg BW and ml/g DMI).

3. Digestibility coefficients:

Results in Table (3) indicated that digestion coefficients were found to vary significantly ($P<0.01$) among the three experimental groups. Yeast and selenized enriched yeast (SEY) supplementation had improved digestion coefficient of Cp, EE, CF and NFE by 4.97, 7.27, 12.36 and 5.73% units and 4.35, 4.76, 9.47 and 4.38% units in goats fed T3 and T2 respectively compared to goats fed T1. Digestion coefficient of CP, EE, CF and NFE showed the highest values in (T3) compared to other treatments. The improvement of CF digestibility might be due to the increase of the numbers of total viable bacteria in rumen and celluloytic bacteria with animals fed yeast (Lile *et al.*, 2004). Therefore, these results indicated that T3 was the best treatment. Also, digestion coefficients of DM and OM were non-significant but increased with goats fed dried yeast T2 and selenium enriched yeast T3 supplementation compared with control group. Digestibility coefficient of NFE being higher for T2 and T3 groups compared to control group (T1) with significant differences (Table, 3). El-Ashry *et al.* (2001) with dried yeast as well as Kholif and Khorshed (2006) and Khattab *et al.* (2009) obtained similar result with selenium enriched yeast. On the other hand, digestibility of NDF, ADF and cellulose were significantly ($P<0.01$) higher in T3 and T2 than those of control. However, digestibility of ADL and hemicellulose were not affected significantly by dietary supplementation. These results may be explained by that; yeast culture supplementation can enhance the digestive process associated with microorganisms in the gastrointestinal tract. Some of these enhancements may be directly related to stimulation of microbial activity and microbial growth because of yeast culture stimulation (Newblod *et al.*, 1990, Offer and Cruive, 1991, Allam *et al.*, 2001 and Ragheb *et al.*, 2003).

4. Nutritive value

The nutritive value as TDN and DCP in Table 3 showed that total digestible nutrients (TDN, g/Kg BW) were insignificantly higher in goats fed T2 followed by T3 than those fed T1 which may be attributed to the higher dry matter intake. These results are in agreement with those result reported by El-Ashry *et al.* (2003) and Ibrahim *et al.* (2006). They found that TDN intake (g/Kg BW) was not significantly different with lambs fed yeast supplementation compared with the control lambs. Whereas TDN as a percentage of DMI was increased significantly ($p<0.05$) in goats fed T3 followed by T2 and T1, respectively. The Digested crude protein (DCP) g/Kg BW was significantly ($P<0.05$) higher for supplementation with yeast (T2 and T3) compared to control ration due to the decreased the CP digestion coefficient in the control group than treated groups. DCP as a percentage of DMI was significantly ($p<0.01$) higher for T3 followed by T2 that those control ration may be due to increased protein digestibility in T3, these result are in agreement with those reported by EL-Ashry *et al.* (2001) and Mohi-Eldin *et al.* (2008) they reported that supplemented diets with yeast increased ($P<0.05$) feeding value of the rations.

5. Nitrogen balance

Parameters of nitrogen intake, excretion, retention and efficiency of nitrogen utilization as affected by type of yeast during digestion trial are presented in Table (4). The results showed that nitrogen intake, fecal nitrogen, urinary nitrogen and total nitrogen excretion were not significantly different with goats fed either yeast or selenium enriched yeast supplementation compared to control group. Nitrogen intake was higher in goats fed T2 followed by T1 and T3 although differences were not significant. This might be due to the increase of dry matter intake in T2. The highest fecal nitrogen value (mg/Kg BW) was higher in control group T1 compared to both T2 and T3 groups. These urinary nitrogen and total nitrogen excretion were higher in goats fed T2 compared to T1 and T3. This result was agreement with Aziz (2004) who found that addition of *Saccharomyces cerevisiae* reduced total nitrogen excretion as (mg/Kg BW).

Nitrogen balance was higher with supplemented yeast to fed goats groups T2 and T3 than untreated one T1. It seems that the yeast supplementation had improved nitrogen balance (as percentage of intake) more than control group. The highest value of nitrogen retention as a percentage of intakes was recorded in T3, followed by T2, while the lowest value was for control T1 group. These results come on line with those obtained by Allam *et al.* (2001) and Aziz (2004) who concluded that yeast treatment improved nitrogen utilization more than control.

6. Rumen liquors parameter

Data concerning the values of ammonia- nitrogen (NH_3-N), total volatile fatty acids (TVFA'S), non-protein nitrogen (NPN), total nitrogen (TN) and true protein (TP) were presented in Table (5). Results

indicated that ruminal TVFA'S value were significantly ($P<0.01$) affected by treatment. Comparison among the three experimental treatments showed that selenized yeast (T_3) and dried yeast (T_2) increased ruminal TVFA'S values compared to control (T_1).

Table (4): Nitrogen balance value of kinds fed the experimental rations.

Item	Experimental groups			
	T_1	T_2	T_3	± SE
Nitrogen intake (mg/Kg BW)	812.48	849.60	790.4	± 40.35
Fecal nitrogen (mg/Kg BW)	344.26	323.09	295.66	± 24.17
Urinary nitrogen (mg/Kg BW)	372.92	400.05	374.02	± 18.20
Total nitrogen excretion (mg/Kg BW)	717.19	723.15	669.68	± 37.39
Nitrogen utilization				
Nitrogen retained (mg/Kg BW)	95.29	126.45	120.72	± 12.17
% of nitrogen intake	11.73	14.88	15.27	± 1.41

Table (5): Some rumen parameters of kids fed the experimental rations.

Item	time	Experimental groups			
		T_1	T_2	T_3	Overall mean
NH3-N (mg/100ml)	0	33.16^{a}±1.22	35.28^{b}±1.65	37.79^{ab}±2.32	35.41^{B}±1.09
	3	38.35^{b}±0.487	44.55^{ab}±0.867	45.54^{a}±3.20	42.81^{A}±1.39
	6	32.34^{a}±0.936	40.42^{b}±1.32	38.78^{ab}±2.11	37.18^{B}±1.80
Overall mean		34.62^{b}±0.936	40.08^{a}±1.32	40.70^{a}±2.11	
VFA's (Ml/equiv/100ml)	0	3.91^{a}±0.168	2.657^{b}±0.341	3.39^{ab}±0.258	3.32^{C}±0.208
	3	5.16^{b}±0.122	4.51^{a}±0.366	5.0^{b}±0.229	4.89^{B}±1.59
	6	6.78^{a}±0.315	5.69^{b}±0.206	5.69^{b}±0.146	6.06^{A}±0.196
Overall mean		5.28^{a}±0.372	4.28^{b}±0.410	4.69^{b}±0.132	
NPN (mg/100ml)	0	43.04^{a}±1.78	52.55^{b}±1.04	54.05^{bc}±1.68	49.88^{C}±1.67
	3	51.94^{c}±1.36	63.06^{ab}±2.12	66.64^{a}±1.49	60.55^{A}±2.08
	6	42.54^{a}±0.646	58.31^{bc}±2.32	61.64^{b}±1.49	54.16^{B}±2.65
Overall mean		45.84^{c}±1.48	57.97^{b}±1.63	60.78^{a}±1.76	
TN= Total nitrogen (mg/100ml)	0	133.75^{a}±3.13	150.15^{b}±4.56	155.36^{b}±1.76	146.42^{B}±3.28
	3	154.15^{c}±1.87	187.45^{b}±6.47	195.66^{a}±4.37	179.09^{A}±6.19
	6	131.01^{a}±3.17	146.14^{b}±4.42	151.90^{b}±1.79	143.02^{B}±3.16
Overall mean		139.64^{c}±3.43	161.24^{b}±6.23	167.64^{a}±6.59	
TP= True protein	0	90.71^{abc}±2.20	97.59^{abc}±5.42	101.19^{ab}±1.53	96.50^{B}±2.24
	3	102.21^{b}±3.02	124.39^{a}±5.44	129.02^{a}±5.59	119.542^{A}±4.57
	6	88.47^{a}±2.63	87.83^{a}±2.32	90.26^{ab}±1.72	88.85^{C}±1.22
Overall mean		93.80^{b}±2.28	103.27^{a}±5.25	107.82^{a}±5.63	
Rate of passage in rumen %/hr		3.40^{b}	3.61^{b}	4.47^{a}	±0.139
Rumen retention (Time,/hr)		29.48^{a}	27.91^{a}	22.45^{b}	±0.999

a, b, c Means at the same raw with different superscripts are significantly different (P<0.05), (P<0.01)
A, B, C Means at the same column with different superscripts are significantly different (P<0.05), (P<0.01)

The higher concentration of ruminal TVFA'S yeast and selenium yeast groups might be a result of altered rumen microbial populations and increase of microbial activity (Aziz, 2004). These results are in agreement with Fayed (2001) and Aziz (2004), who found that addition of yeast culture to the rations of ruminants increased ruminal TVFA'S concentration. The major effect of yeast on ruminal fermentation included an increase of VFA'S and propionate concentration (Lila *et al.*, 2004). On the other hand, the lowest concentration of VFA'S (mg equiv./100 ml) was recorded at zero time before feeding and reached the highest ($P<0.01$) value at 6 hr post feeding which might be related to the fermentation of unstructured carbohydrates of the ration as reported by Aziz (2004).

Results indicated that ruminal NH_3-N and NPN production significantly ($P<0.01$) affected by type of yeast supplementation to the kids diet. The mean value of ruminal NH_3-N and NPN was the lowest in T1 compared to the other two groups (T2 and T3) where they scored the highest ones.

These results are in accordance with those obtained by Fuller and Johnson (1981) they found that yeast stimulate the rumen bacteria which consumed much amount of ammonia for its growth. Erasmus *et al.*, (1992) related the decreased concentration of NH_3-N on yeast culture supplementation with higher microbial protein synthesis in the rumen.

The mean value of ruminal NH_3-N and NPN concentration at the different sampling times clearly showed the lowest value ($P<0.01$) at zero hrs., whereas the highest value was recorded at 3 hrs. post-feeding. This increase in NH_3-N and NPN concentration of post- feeding times may be related to degradation of dietary degradable protein (Aziz, 2004). These results are dis-agreed with Aziz (2004), Kholif and Khorshed (2006) and Kholif and Kholif (2008) they showed that NH_3-N concentration increased ($P<0.01$) post-feeding times.

Ruminal total nitrogen and true protein nitrogen were increased ($P<0.01$) with animals fed on selenium yeast (T3) compared with the other treatments (T2 and T1). The highest values of ruminal total nitrogen and true protein nitrogen (which observed with animal fed on selenized yeast followed by yeast). These results improvement of rumen environment and microflora activity, which produce more microbial protein (Kholif and Khorshed (2006) and Kholif and Kholif (2008). From another point of view, increased bacterial flora in animals fed *S. cerevisiae* is related to the action of yeast on the rumen and increased bacterial population, which led to an increase in both the degradation of fibre in the rumen and the flow of microbial protein from the rumen (Wallace and Newbold, 1992). The overall mean of ruminal TN and TP concentration at the different sampling times clearly showed lowest ($P<0.01$) value at 6 hrs. of feeding. Whereas the highest ($P<0.01$) one was recorded at 3 hrs. post-feeding (Table, 5). At the end, yeast dried or selenized yeast supplemented to diets improved rumen parameters.

7. Rate of passage in rumen:

It is clear that the maximum value of rate of passage recorded in T3 (4.47%/ h) followed by T2 (3. 61%/h) and the lowest flow rate was found in the control treatment (T1, 3.40%/h). However, the shortest ruminal retention time appeared in T3 groups while T1 reported the longest retention time.

The results of our experiment indicated that addition of yeast alone or combined with selenium had a positive effect on rumen rate of passage. However, Rumen dilution rate can influence feed intake and digestibility which is affected by the length of time available for rumen fermentation as well as efficiency of microbial protein synthesis in rumen (Owens and Isaacson, 1977). In the current study, increasing rate of passage is associated with improving the digestibility as shown in Table (3). This may be due to improving the efficiency of microbial protein synthesis in rumen as a result of a significant increase of rate of passage (Owens and Goetsch, 1986 and AFRC, 1992). In addition, increasing rumen ammonia concentration with adding yeast, alone or combined with selenium in compared to the control treatment (Table 5) is supporting this hypothesis. Satter and Slyter (1974) and Balcells *et al.* (1993) indicated that ruminal microbial growth is limited by ammonia concentration levels.

8. Blood parameters:

Results of different blood parameters as were platted in Figures (1, 2, 3 and 4). Urea concentration (Fig. 1) was significantly reduced by yeast supplemented at zero time and at 6 hrs. post-feeding compared to control group. It is clear that the lowest value of urea was for T3 followed by T2 compared to control T1 group. The lowest value was for selenized yeast group at 6 hrs. post-feeding and the highest value was for control group at zero time of feeding. These results are in agreement with Kholif *et al.* (2000) who reported significant increase in serum urea nitrogen concentration with yeast culture supplement. However, Aziz (2004) and Khattab *et al.* (2009) reported that serum urea of all treatments significantly decreased compared with control group. Figure (2) clearly showed that adding yeast or selenized yeast increased creatinine at zero time and 6 hrs. post-feeding more than control group. The lowest value was for control group T1 at zero time of feeding and the highest value was for dried yeast group T2 at 6 hrs. post-feeding. The data showed that creatinine values increased at 6 hrs. post-feeding more than at zero time of feeding. Fayed (2001) and Aziz (2004) obtained similar results.

Data of Figure (3) clearly showed that serum GOT activity values were higher for dried yeast T2 and control T1 groups compared to selenized yeast (T3). It is interest to note that GOT values at 6 hrs. post-feeding were higher than that at zero time. Also Figure (4) indicated that serum GPT activity values were affected by treatments. The highest value was for dried yeast group (T2) at zero time of feeding and the lowest value was for (T3) at 6 hrs. post feeding. These results indicated that supplementing yeast or

selenized yeast to goat rations had no significant effect on liver activity or animal health. Results were in accordance with those reported by Kholif and Khorshed (2006) and Kholif and Kholif (2008). Likewise, Kumar *et al.* (2009) concluded that supplementation of Se at 0.15 and 0.30 ppm level had no significant effect on SGPT and SGOT activity in the lambs.

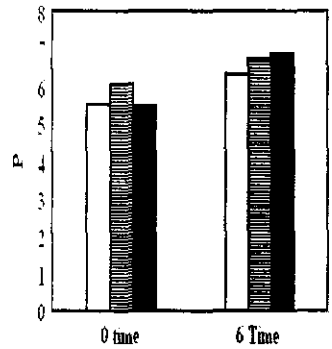


Fig. (1). Phosphours (mg/dl)

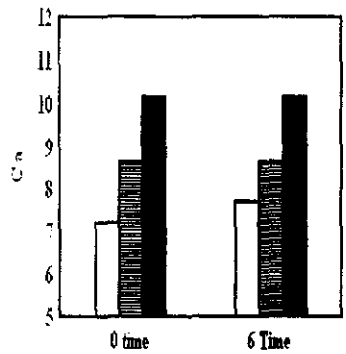


Fig. (2). Calcium (mg/dl)

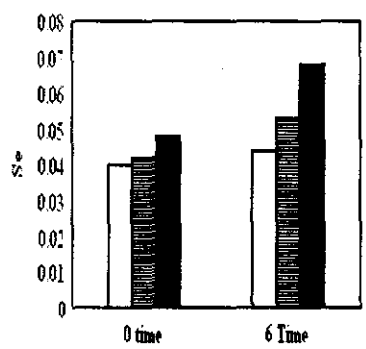


Fig. (3). Selenium (ppm)

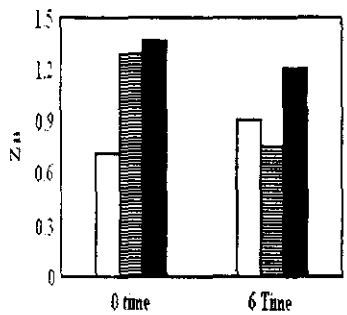


Fig. (4). Zinc (ppm)

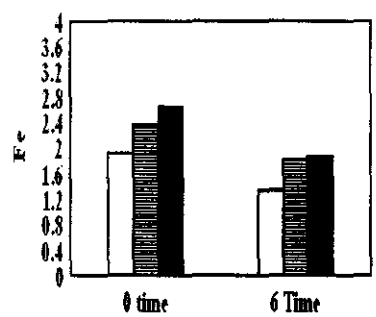


Fig. (5). Iron (ppm)

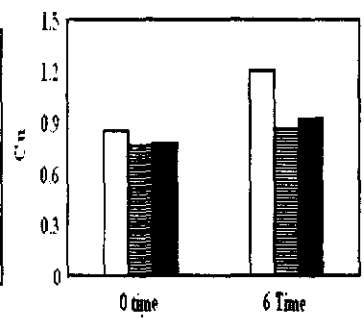
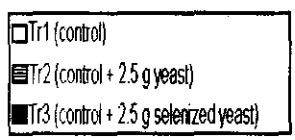


Fig. (6). Copper (ppm)



Some mineral blood parameters of kids fed the experimental ration

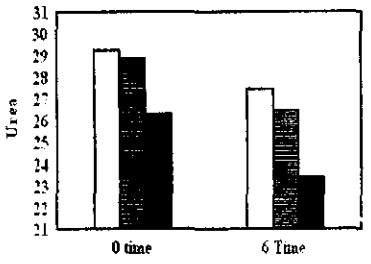


Fig. (1). Urea (mg 100 ml)

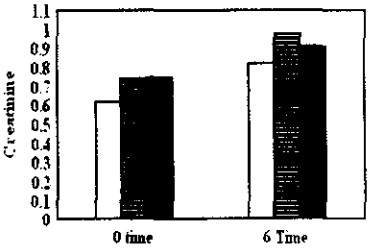


Fig. (2). Creatinine (mg 100 ml)

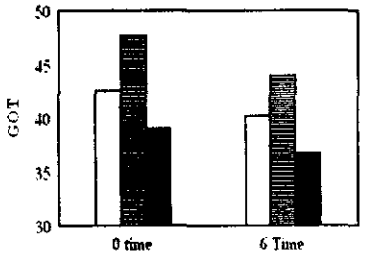
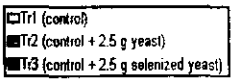


Fig. (3). GOT (U/L)



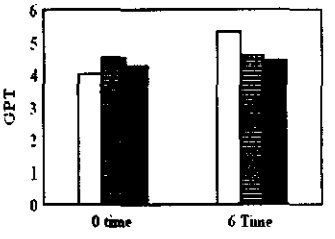


Fig. (4). GPT (U/L)

Some blood parameters of kids fed the experimental ration

9. Some blood minerals:

Data (Figures 1, 2, 3, 4, 5 and 6) illustrated that the effect of adding dry yeast or selenium enriched yeast supplementation on some serum minerals like Phosphorus (P), Calcium (Ca), Selenium (Se), Zinc (Zn), Iron (Fe) and Copper (Cu). Data indicated that Phosphorus concentration increased by addition of dry yeast T2 and selenium enriched yeast T3 compared to control group T1. The lowest value was for control at zero time of feeding and the highest value was for T3 at 6 hrs post-feeding (Fig, 1).

Results in Figure (2) noticed that calcium (mg/dl) was increased by addition of yeast and selenium enriched yeast compared to control. The lowest value was for control group T1 at zero time of feeding and the highest value was for T3 at 6 hrs post-feeding.

As shown in \Fig. (3), there was no differences in selenium level in blood serum of kids fed the experimental diets in zero time. It is also clear that serum Se value was increased at 6 hrs. post-feeding compared to zero time of feeding. The lowest value was for T1 at 6 hrs post-feeding and the highest value was for T3 group at 6 hrs post-feeding. The higher intake of Se in goats fed selenium-enriched yeast T3 might be responsible for increasing Se levels in the blood serum of those animals.

The incorporation into the diet of ascending concentration of Se as selenium enriched yeast increased whole blood total Se (Juniper *et al.*, 2009)

Nicholson *et al.* (1991) reported similar observations in cattle calves supplemented with inorganic or organic Se 1mg/day in their diet and Mudgeal *et al.* (2008) in male buffalo calves supplemented with 0.3 ppm Se. Data illustrated in Fig. (4) indicated that there were no differences in Zn level in blood either in fasting or 6 hrs post-feeding among the different experimental animals. It is clear that Zn level was decreased at 6 hrs post-feeding compared to pre-feeding values. Similarly, Khattab *et al.* (2009) concluded that levels of Zn in blood of animals supplemented with yeast were elevated at zero time.

As shown in Figure (5) Fe level of T2 and T3 were higher than control animals in fasting and post feeding state with differences being significant. The lowest values were for T1, T2 and T3 at 6 hrs. post-feeding compared to zero time pre-feeding.

The higher level of iron in blood serum of the experimental animals (T2 and T3) in different levels might be due to high content of these minerals in yeast itself. The highest value of Cu (ppm) was recorded for control T1 group followed by T2 and T3 groups in fasting and post-feeding (Fig. 6). Results also showed increase of Cu at 6 hrs after feeding.

CONCLUSION

Generally, It is concluded that dried yeast or selenium enriched yeast supplemented to diets of growing goat kids had improved daily gain, feed efficiency digestibility coefficients, rumen fermentation and utilization and absorption of minerals consequently improving animals performance under desert conditions of southern Sinai.

REFERENCES

A.O.A.C. (1999). Official methods of analysis association of Analytical chemists, 16th Ed. A.O.A.C. International, Washington, DC., USA.

Abdou, Ahlam R.; E.Y. Eid; M. El-Essawy. Abeer; M. Fayed. Afaf; H. G. Helal and H. M. El-Shaer (2011). Effect of feeding different sources of energy on performance of Goats fed Saltbush in Sinai. J. American Sci., 7(1), (cumulated no. 34).

Abou'l Ella, A.A. (2007). Effect of dry yeast and/or bentonite as feed additives on the productive performance of lactating ewes and its off spring's. Egyptian J. Nutrition and feeds: 10 (1): 81-98.

AFRC. (1992). Agriculture and Food Research Council. Nutritive requirements of ruminant animals. Protein. Nutr. Abs. Rev. Ser. B 62: 787-835.

Allam, A. M; K. El-Shazly; B. E. A. Borhami and M. A. Mohamed (2001). Effect of baker yeast (*Saccharomyces cerevisiae*) supplementation on digestion in sheep and milk response in dairy cows. Egypt J. Nutritional and feeds, 4 (special Issue): 315- 323.

Anderson, D. B.; V. J. Mc Cracken; R. I. Aminov; J. M. Sunpson; R. Mackie, M.W. A. Verstegen and H. R. Gaskins (1999). Gut microbiology and growth–promoting anti biotics in swine, pig News info, 20;115 N-122N.

Aziz, Hend A. (2004). Studies on effect of some Non-hormonal growth promoters on growth rate and some rumen parameters in small ruminants under desert condition. M. Sc. Thesis, Aim-Shams Univ., Face of Agric.

Balcells, J., J. A. Guava, C. Castillo, J. Gaza, (1993). Rumen digestion and urinary excretion of purine derivatives in response to urea supplementation of sodium-treated straw fed to sheep. Br. J. Nut. 69, 721–732.

Boil, R. J. and Phillips, G.D. (1988). Effect of formation protein source and surgical modification of the intestinal tract up on flows of calcium, phosphorus and magnesium in the digestive tract of sheep. can. J. Anim. Sci. 68: 853.

Devega, A. and D. P. Poppi (1997). Extent of digestion and rumen conditions as factor affecting passage of liquid and digest particles in sheep. J. Agri. sci., Cambridge, 128: 207-215.

Duncan, D.B. (1955). Multiple ranges and multiple F- test Biometrics, 11: 1- 42.

El-Ashry, M. A.; Afaf M. Fayed, K. M. Youssef, F. A. Salem and Hend. A. Aziz (2003). Effect of feeding flavomycin or yeast as feed supplement on lamb performance in Sinai. Egypt. J. Nutritional and feeds, 4 (special Issue): 1009- 1022.

El-Ashry, M.A.; Zeba A. Motagally and Y. A. Moareck (2001). Effect of live dried baker's yeast and yeast culture on performance of growing buffalo calves. Egypt. J. Nutritional and feeds, 4 (special Issue): 607- 617.

El-Ayek, M. Y.; Abdel A. E. Khalek; K. T. Osman and S. A. Ebrahim, (2009). Effect of dietary supplementation of yeast culture with or without premix on performance of lactating Egyptian Buffalo cows: 1- Digestibility and milk production. Egyptian J. Nutrition and feeds, 12 (3) special Issue: 107- 117.

El-Ayek, M. Y; A. E. Abdel Khalek; K. T. Osman and S. A. Ebrahim. (2009). Effect of Dietary supplementation of yeast culture with or without premix on performance of lactating Egyptian Buffalo cows: 1- Digestibility and milk production. Egyptian J. Nutrition and feeds., 12 (3) special Issue : 107- 117.

El-Ayouty, S. A.; A. M. Abd-El-Khabeir, I. Bahira. Kamel and A. M. Abdel-Hamid (1991). Effect of selenium supplementation on growth and blood selenium in growing calves. J. Agric. Sci., Mansoura Univ., 16: 2786.

El-Shaer, E. K. H. (2003). Effect of yeast culture supplementation and concentrate roughage ration performance of growing lambs. Ph.D. Thesis, Fac. of Agric., Mansoura Univ. Egypt.

Erasmus, L. J.; Botha, P. M. and Kistner, A. (1992). Effect of yeast culture supplement on production, rumen fermentation and duodenal nitrogen flow in dairy cows. J. Dairy Sci. 1992, 75: 11, 3056- 3065.

Fayed, Afaf M. (2001). Effect of using Yea- Sacc on sheep and goats in Sinai. Egyptian J. Nutrition and feeds, 4 (2): 419.

Fehrs, M.S.; Miller, W. J.; Gantry, R.P.; Neathery, M. W.; Blackmon, D.M.; Heinmiller, S.R (1981). Effect of high but non-toxic dietary intake of copper and selenium on metabolism in calves. Journal of Dairy science. 64: 1700- 1706.

Fuller, J. R. and D. E. Johnson (1981). Monensin and Lasalocid effects on fermentation in vitro. J. Anim. Sci. 53: 1574.

Gabryszuk, M. and Klewiec, J. (2002). Effect of injecting 2 and 3-year-old ewes with selenium and selenium-vitamin E on reproduction and rearing of lambs. Small Ruminant Research, V. 43, p. 127- 132.

Grovum, W. H. and V. J. Williams (1973). Rate of passage of digesta in sheep: 4. passage of markers through the alimentary tract and the biological relevance of rate constants derived from changes in concentration of marker in feces. Br. J. Nutr. 30, 313- 329.

Gunter, S. A.; P. A. Beck, and J. M. Philips (2003). Effect of supplementary selenium source on the performance and blood measurements in beef cows and their calves. J. Anim Sci. 81: 856-864.

Ibrahim, F. A.; Safaa N. Abdl El-Azeem; Kh. M. M. Mousa and Hoda M. El-Hosseiny (2006). Impact of using feed additives with corn Stover Silage in lamb rations on performance, digestibility, rumen activity, some blood constitutes and carcass traits J. Agric. Sci., Mansoura Univ., 31 (5): 2671.

Juniper, D. T; R. H. phipps; E. Ramos-Morales; G. Bertin (2009). Effects of dietary supplementation with selenium enriched yeast or sodium selenite on selenium tissue distribution and meat quality in lambs. Animal feed science and technology, 1492 (228-239).

Kearl, L. C. (1982). Nutrient requirements of ruminants in developing Countries. Utah Agric. Exp. sta. Utah State Univ. Logan , U.S.A.

Khalifa, H. H.; M. A. El-Ashry; K. Shahen; Nazly, M. El-Kholian; Hoda A. Khalifa. (2001). Effect of non-hormonal growth promoters on growth carcass characteristics and body composition of buffalo calves. 1-Effect of yeast culture. Egyptian J. Nutrition and feeds, 4 (special Issue) : 619.

Khattab. H. M.; H. M. El-Sayed; A. M. Mansour; S.A. Emara and G.A. Gouda (2009). Effect of using clay minerals (Bentonite & Tafla) and baker's yeast on the digestibility and metabolism in high roughage rations of lactating buffaloes. Egyptian J. Nutrition and feeds, 12 (3) special Issue: 59- 70.

Kholif, A. M. and S. M. Kholif (2008). Effect of selenium enriched yeast supplementation on the productive performance of lactating Buffaloes. Egyptian J. Nutrition and feeds 11(1): 187-200.

Kholif, A. M; H. A. El-Alamy; M. A. El-Ashry; H. M. El-Sayed and T. A. Ali (2000). Effect of supplementation of different types of live yeast cultures in the diet on the productive performance of lactating buffaloes. Egyptian J. Dairy Sci., 28: 281-295.

Kholif. S. M. and M. M. Khorshed (2006). Effect of yeast or selenized yeast supplementation to rations on the productive performance of lactating Buffaloes. Egyptian J. Nutrition and feeds 9 (2): 193-205.

Kumar, N.; Garg, A. K.; Dass, R. S.; Chaturmed, V. K.; Muddgal, V.; Varshnet, V. P (2009). Selenium supplementation influences growth performance, antioxidant status and immune responses in lambs. Indian Veterinary research Institute, Izalnagar 243122, Uttar Pradesh, India.

Lila Z. A.; N. Mohammed; T. Yasui; Y. Kurokawa; S. Kanda and H. Itabashi (2004). Effects of a twin strain of *Saccharomyces cerevisiae* live cells on mixed ruminal microorganism fermentation in vitro J. anim. Sci. 82: 1847- 1854.

Maynard, L. A; J. K. Loosli; H. S. Hintz and R. G. Warner (1978). Animal Nutrition (7^{th}). McGraw Hill, New York, N.Y.

Mohi-Eldin, A. M. A.; Fathia, A. Ibrahim and E. E. Ragheb (2008). Effect of using Natural feed additives on feed utilization and growth performance of growing Friesian male calves. Egyptian. J. Nutrition and feeds. 11 (1): 159-170.

Mudgal, V.; Garg, A. K.; Dass, R. S.; Varshney, V. P. (2008). Effect of selenium and copper supplementation on blood metabolic profile in male Buffalo (*Bubalus bubalis*) calves. Biol. Trace Element Res. 121: 31- 38.

Newbold, C. J.; P. E. V. Williams; N. Mckain; A. Walker and R. J. Wallace (1990). The effects of yeast culture on yeast number and fermentation in the rumen of sheep. Proc. Nutr. Soc., 49: 474.

Nicholson, J. W. G; Mc Queen, R. E. and Bucsh, R. S. (1991). Response of growing cattle to supplementation with organically bound or inorganic sources of selenium or yeast cultures. can J. Anim Sci. 71: 803- 811.

Offer, N. W. and A. Cruive (1991). Maximizing fiber digestion in the rumen: the role of yeast culture. In Biotechnology in the feed Industry, sixth annual. Symp. proc. of Alltech, Publ, Kentucky, USA, p. 79.

Ortman, K. and B. Pehrson (1999). Effect of selenate as a feed supplement in dairy cows in comparison to selenite and selenium yeast. J. Anim . Sci. 77, 3365-3370.

Owens, F. N. and H. R. Isaacson (1977). Ruminal microbial yields: Factors influencing synthesis and bypass. Fed. Proc. 36:198.

Owens, F.N. and A. L. Goetsch (1986). Digesta passage and microbial protein synthesis. In Control of Digestion and Metabolism in Ruminants (ed. L.P. Milligan, W.L. Grovum and A. Dobson), pp.196-223. Prentice-Hall, Englewood Cliffs, N. J., USA.

Patton, C.J. and Croush , S.R. (1977). Enzymatic determination of urea. Analytical chemistry. 49: 464-469.

Ragheb, E. E.; A. F. Mehrez and A. E. Abd El- Khalek (2003). Digestibility coefficients, blood parameters, feed efficiency and growth performance of weaned Friesian calves fed diet supplemented with Lacto–Sacc. Egyptian J. Nutrition and feeds. 4 (special Issue): 693-702.

Reitman, S. and S. Frankel (1957). Colorimetric method for the determination of serum glutamic–oxaloacetic and glutamic–pyruvate transaminase. Am. J. Clin. Path., vol., 28, p: 56.

SAS (2000). Statistical Analysis Systems Institute Inc., Release 8.1, Cary, Nc., USA.

Satter, L.D., L.L. Slyter, (1974). Effect of ammonia concentration on rumen microbial protein production in vitro. Br. J. Nutr. 32, 199–208.

Van Soest, P. J.; Robertson, J. B. and Lewis, B. A. (1991). Methods for dietary fibre, neutral detergent fibre and non- starch polysaccharides in relation on animal nutrition. J. Dairy, Sci. 74, 3583.

Wallace R. J. and C. J. Newbold (1992). Probiotics for ruminants. Page 317 in Probiotics: The scientific basis. R. fuller, ed. Chapman and Hall. London, U.K.

Warner, A.C.J. (1964). Production of volatile fatty acids in the rumen methods of measurements. Nutr. Abst , Rev., 34: 339.

الاستفادة من اضافة الخميرة الي عليقة الماعز في جنوب سيناء

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أجريت هذه الدراسة بهدف دراسة تأثير اضافة الخميرة او الخميرة المدعمة بالسيلنيوم الى عليقة الجداء و تاثير ذلك على معدل النمو و معاملات الهضم و ميزان الازوت و بعض مقايس سوائل الكرش و سيرم الدم و بعض الاملاح فى الدم حيث استخدم عدد 18 من الجداء البلدى اعمارهم حوالة 4 شهور و متوسط الوزن 11.9 كيلو جرام و تم تقسيمهم الى 3 مجموعات عشوائية بكل مجموعة 6 حيوانات و تم تغذية المجموعات كالتالى:

المجموعة الاولى: 60% علف مركز + 40% دريس برسيم (مقارنة)
المجموعة الثانية: عليقة المقارنة + 2.5 جرام للرأس فى اليوم خميرة
العليقة الثالثة: عليقة المقارنة +2.5 جرام للرأس فى اليوم خميرة مدعمة بالسلينيوم

أستمرت فترة التجربة 180 يوم و فى نهايتها تم اجراء تجربة هضم لتقيم العلائق على عدد 12 حيوان و أستمرت 14 يوم فترة تمهيدية + 7 ايام جمع للعينات (المأكول والروث و البول) و فى نهاية فترة الجمع تم جمع عينات من سائل الكرش قبل التغذية و بعد 3 ساعات و 6 ساعات من التغذية و تم اخذ عينات من الدم قبل التغذية و بعد 6 ساعات من التغذية و كانت اهم النتائج كما يلى: أدت إضافة الخميرة الجافة او الخميرة المدعمة بالسيلنيوم ليس لها تأثير معنوى على المادة الجافة المأكولة و التغير فى وزن الجسم. كما أدت اضافة الخميرة او الخميرة المدعمة بالسيلنيوم الى تحسين معامل هضم المادة الجافة و العضوية و البروتين الخام و المستخلص الاثيرى و الالياف الخام و المستخلص الخالى من النيتروجين و بعض مكونات الالياف NDF,ADF ,ADL والسليلوز والهيميسليلوز بالمقارنة بمجموعة الكنترول. كما أدت اضافة الخميرة المدعمة بالسيلنيوم (المجموعة 3) الى زيادة المعنوية فى معامل هضم البروتين و الدهن و الالياف و المستخلص الخالى من الازوت و كذلك مكونات الالياف يليها مجموعة الخميرة مقارنة بمجموعة الكنترول و تحسنت القيمة الغذائية بالنسبة للمادة الجافة المأكولة فى المجموعة الثالثة المضاف اليها خميرة السيلنيوم مقارنة بمجموعة الكنترول. و كان ميزان النيتروجين عاليا فى حيوانات المجموعة الثانية و كانت الاختلافات غير معنوية. كما ادت اضافة الخميرة المدعمة بالسيلنيوم الى زيادة تركيز الامونيا و المواد النيتروجينية الغير بروتينية و النيتروجين الكلى و البروتين الحقيقى بعد 3 ساعات من الاكل بالمقارنة بالمجموعة الكنترول. و زاد تركيز الكرياتينين فى الدم و انزيمات الكبد و كذلك الاملاح فى الدم (فسفور ، كالسيوم ، سيلنيوم، زنك ،حديد) بأضافة الخميرة او الخميرة المدعمة بالسيلنيوم ماعدا النحاس.

لذلك يوصى بأضافة الخميرة المدعمة بالسيلنيوم لتدعيم نقص الاستفادة من السيلنيوم فى تغذية الماعز خصوصا فى المناطق الصحراوية حيث انها حسنت بعض معاملات الهضم و القيمة الغذائية و تخمرات الكرش و بعض قياسات الدم و الاملاح وذلك دون التأثير على صحة الحيوان.

الاستفادة من اضافة الخميرة الي عليقة الماعز في جنوب سيناء

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المجموعة الثانية: عليقة المقارنة + 2.5 جرام للرأس فى اليوم خميرة
العليقة الثالثة: عليقة المقارنة +2.5 جرام للرأس فى اليوم خميرة مدعمة بالسلينيوم

أستمرت فترة التجربة 180 يوم و فى نهايتها تم اجراء تجربة هضم لتقيم العلائق على عدد 12 حيوان و أستمرت 14 يوم فترة تمهيدية + 7 ايام جمع للعينات (المأكول والروث و البول) و فى نهاية فترة الجمع تم جمع عينات من سائل الكرش قبل التغذية و بعد 3 ساعات و 6 ساعات من التغذية و تم اخذ عينات من الدم قبل التغذية و بعد 6 ساعات من التغذية و كانت اهم النتائج كما يلى: أدت إضافة الخميرة الجافة او الخميرة المدعمة بالسيلنيوم ليس لها تأثير معنوى على المادة الجافة المأكولة و التغير فى وزن الجسم. كما أدت اضافة الخميرة او الخميرة المدعمة بالسيلنيوم الى تحسين معامل هضم المادة الجافة و العضوية و البروتين الخام و المستخلص الاثيرى و الالياف الخام و المستخلص الخالى من النيتروجين و بعض مكونات الالياف NDF,ADF ,ADL والسليلوز والهيميسليلوز بالمقارنة بمجموعة الكنترول. كما أدت اضافة الخميرة المدعمة بالسيلنيوم (المجموعة 3) الى زيادة المعنوية فى معامل هضم البروتين و الدهن و الالياف و المستخلص الخالى من الازوت و كذلك مكونات الالياف يليها مجموعة الخميرة مقارنة بمجموعة الكنترول و تحسنت القيمة الغذائية بالنسبة للمادة الجافة المأكولة فى المجموعة الثالثة المضاف اليها خميرة السيلنيوم مقارنة بمجموعة الكنترول. و كان ميزان النيتروجين عاليا فى حيوانات المجموعة الثانية و كانت الاختلافات غير معنوية. كما ادت اضافة الخميرة المدعمة بالسيلنيوم الى زيادة تركيز الامونيا و المواد النيتروجينية الغير بروتينية و النيتروجين الكلى و البروتين الحقيقى بعد 3 ساعات من الاكل بالمقارنة بالمجموعة الكنترول. و زاد تركيز الكرياتينين فى الدم و انزيمات الكبد و كذلك الاملاح فى الدم (فسفور ، كالسيوم ، سيلنيوم، زنك ،حديد) بأضافة الخميرة او الخميرة المدعمة بالسيلنيوم ماعدا النحاس.

لذلك يوصى بأضافة الخميرة المدعمة بالسيلنيوم لتدعيم نقص الاستفادة من السيلنيوم فى تغذية الماعز خصوصا فى المناطق الصحراوية حيث انها حسنت بعض معاملات الهضم و القيمة الغذائية و تخمرات الكرش و بعض قياسات الدم و الاملاح وذلك دون التأثير على صحة الحيوان.