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THE EFFECT OF YEAST CULTURE PRODUCTS (RUMISACC AND INTETOTAL) ON FATTENING PERFORMANCE, SOME BLOOD AND RUMEN FLUID PARAMETERS IN MALE KIDS

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ABSTRACT

The aim of this study was to evaluate the effects of live yeast culture and the combination of live yeast culture with vitamin-mineral supplementation as a feed additive on fattening performance, some blood and rumen fluid parameters in male kids. Totally 18 male Saanen goat kids were divided in to one control and two treatment groups each containing 6 kids. Rations of groups were formulated as isonitrogenic and isocaloric. Live yeast culture (YC) and the combination product (YVM) (RumiSacc® and Intetotal® respectively,by Integro Food Industry and Trade Co., Istanbul, Turkey; Live yeast cell 344 x 10^{10} cfu per gram) was included in the concentrates at 0 (C), 1% (YC) and 1% (YVM) on feed basis, respectively. Feeding schedule was established with only concentrate. Feed was given *ad libitum* and roughage was not given. Dietary yeast culture at the level of 1% increased final live weight (+4.7% regarding control group). All investigated fattening performance with rumen fluid and blood parameters were not statistically affected with the supplements. It is concluded that live yeast culture and its vitamin-mineral combination did not have adverse affect in male kids fed without roughage.

Keywords: Live yeast culture, fattening performance, blood parameters, rumen parameters, kid

INTRODUCTION

Yeast and yeast products are often used in ruminant diets to manipulate rumen fermentation and improve animal performance. The benefits of live yeast culture are well understood however researchs of its products in small ruminants are limited. Studies that have examined effects of yeast cultures have reported variable results. These differences may depend on many factors such as diet composition, forage to concentrate ratio, type of forage feed, yeast dose, feeding strategy and stage of lactation (YALÇIN ET AL., 2011).

Studies reported that yeast supplementation increase growth, feed intake and nutrient utilization in Black Bengal kids (PAL ET AL., 2010), improved feed conversion ratio of Awassi lambs (HADDAD AND GOUSSOUS, 2005), In contrast yeast supplementation did not always improve the animal performance. One of the study on Awassi lambs and Shami goat kids reported, yeast supplementation had no effect on average daily gain and dry matter intake (TITTI ET AL., 2008). One of the study on Saanen dairy goats in early lactation period show that addition of live yeast to diet increased dry matter intake and milk yield (STELLA ET AL., 2007).

Some of studies found that yeast culture supplementation did not affect on some serologycal blood parameters in goats (ÖZSOY ET AL., 2013) and in dairy cows (YALÇIN ET AL., 2011). However GALIP (2006) reported that dietary yeast culture altered serum total protein, urea, calcium concentrations, Ca/creatinine ratio, triglyceride concentrations in rams.

Addition of yeast culture in diets of ruminants had conflictual results on rumen fatty acid (VFA) concentration. One of the report on dairy cows with two different saccaromyces strain indicated that strain has an importance and that can be modify ruminal ammonia, propionate and butirate concentration, however have no effect on productive performance (PINOS-RODRIGUEZ ET AL., 2008). Also another investigation (DOLEZAL ET AL., 2005) in which the effect of addition of a yeast culture (*Saccharomyces cerevisiae*) on rumen fermentation in dairy cows indicated a positive effect on production of VFA. DESNOYERS ET AL. (2009), reported that the positive effect of yeast supplementation on rumen pH increased with the percentage of concentrate in the diet and with the dry matter intake level. They also indicated that the positive effect of yeast supplementation on rumen VFA concentration increased with dry matter intake and crude protein levels. Related with active dried yeasts in young ruminants, CHAUCHEYRAS-DURAND ET AL. (2008) also mentioned that yeast have a stabilization function on rumen pH.

The goat population was about 5 million in Turkey and one of the prefered dairy goat species is Saanen. Male kids have less economic value for dairy farms in birth season compared with females. Also there is growing concern on combination feed additives because of economic reasons. Live yeast vitamin-mineral combination is one of it. Effects of supplementing live yeast culture (Rumisacc® İntegro Gıda AŞ, Turkey) and the combination of live yeast culture with vitamin-mineral (Intetotal® İntegro Gıda AŞ, Turkey) to concentrate rations fed to fattening male saanen kids have not been studied. Therefore, the objective of this study was to evaluate the effects of these products supplementation to fattening diets of male Saanen kids on feed intake, growth performance, and some blood parameter and ruminal volatile fatty acids.

MATERIAL AND METHOD

Investigation was started with the permission of animal experiments local ethical committee of Mehmet Akif Ersoy University. A total of 18 male Saanen kids aged 2 months were used at the study. All the animals were treated for internal and external parasites using Ivomec (Novakim; active ingredient: 10 mg/ml Ivermectin; dose: 1ml/50 kg live weight) 2 weeks before the experiment started. This study was conducted at the commercial feedlot for 11 weeks from May 2013 to July 2013. Kids were housed individual cages (2m x 3m) under the shed with concrete floor with sawdust and dry manure bedding for the entire period of the experiment. Concentrates were prepared in a feedmill as a mash feed. The rations were formulated to be isocaloric and isonitrogenous. The ingredients and the chemical composition of the concentrates are presented in *Table 1.* Live yeast culture and its vitamin-mineral combination product (RumiSacc® and Intetotal® respectively, Integro food Industry and Trade Co., Istanbul, Turkey) were both included in the concentrates at 1,0%. Cu concentration of YVM (Intetotal®) decreased by producer because of mineral concentration of experimental ration. During the study concantrates and fresh water were given *ad libitum* and the ration was not contain roughage. Feed refusals were collected once a week and weighed to accurately determine feed intake.

Nutrient composition of concentrates, live yeast culture and its vitamin-mineral combination product were determined according to the AOAC (2000).The metabolizable energy levels of concentrate feeds were determined by using the following formula of TSI (1991).

ME (kcal/kg OM) = 3260 + (0.455xCP) – (4.037xCF) + (3.517xEE) where CP (crude protein), CF (crude fibre) and EE (ether extract) were expressed as g/kg OM (organic matter) and converted dry matter (DM) basis.

Table 1. The ingredients and chemical composition of the concentrate feeds

Ingredients, % as feed basis	Dietary treatments		
	C	YC	YVM
Corn	35	35	35
Barley	21	21	21
Wheat Bran,	11	11	11
Full fat soy	11	11	11
Sunflower meal, 36% Crude Protein	10	10	10
Soybean meal, 48% Crude protein	7	6	6
DCP	1.7	1.7	1.7
Canola oil	1	1	1
DL-methionine	0.1	0.1	0.1
L-Lizin hidrochloride	0.1	0.1	0.1
Live yeast culture[1]	-	1	-
Live yeast – vitamin,mineral combination[2]	-	-	1
Lime stone	1.5	1.5	1.5
Salt	0.4	0.4	0.4
Vitamin mineral premix[3]	0.2	0.2	0.2
Analysed composition, % as feed basis			
Dry matter, %	88.38	88.40	88.09
Crude protein, %	16.34	16.68	16.38
Ether extract, %	5.31	5.94	6.06
ME, kcal/kg ME	2648.21	2674.35	2668.53

C: Control group; YC:group fed with diet containing live yeast culture;YVM: group fed with died containing the combination of live yeast culture with vitamin and mineral, 1: RumiSacc, Integro Food Industry and Trade Co., İstanbul, Turkey, 2: Intetotal, Integro Food Industry and Trade Co., İstanbul, Turkey, 3: Each kilogram of vitamin-mineral mix contains 12 000 000 IU A vit, 20 000 mg E vit, 50 000 mg Mn, 50 000 mg Fe, 50 000 mg Zn, 10 000 mg Cu, 800 mg I, 150 mg Co, 150 mg Se

Animals were individually weighed at the beginning of the experiment and every two weeks. The average daily weight gain over the duration of experiment was determined individually. Daily dry matter intakes of the kids were determined and feed conversion ratio was calculated as kg feed per kg live weight gain of kids individually.

Rumen fluid samples were collected in two bottles from all kids in each group during the slaughtering process. One bottle of rumen fluid sample was used for the measurement of pH and the other one was for VFA. The pH was measured immediately by a pH meter (Hanna pH meter, model no: Hi917hN). Rumen fluid samples were filtered from cheese cloth before VFA analysis. After centrifugalize (10.000 rpm, 10 min at +4°C) concentrations of VFA in the supernatant were determined by HPLC system of Agillent 1260 series (Agillent Technologies, Waldronn, Germany) equipped with a Agilent-detector (1260 MVDVL) operated at 210 nm. Separation of acids was conducted using an organic acid analysis column (300 x 7.7 mm; Hi-plexH-organic acid column), with 0.005 M H_2SO_4 as eluent, at flow rate of 0.6 ml/min, and with the column temperature of 55°C. Concentrations of ammonia-N were determined by distillation (Gerhard, vapodest 2000) and titration, by using 5 ml of the rumen fluid which filtered by cheese cloth (ANONYMOUS, 2014).

Blood samples were taken in two tubes from jugular vein containing EDTA for hematological analysis and without EDTA for biochemical analyzes with the aid of the cannula at the last day of the experiment. Tubes for biochemical analysis were centrifuged at 3000 rpm at room temperature for 5 minutes and then serum was carefully harvested for determination of total cholesterol, triglyceride, glikoz and blood urea nitrogen (BUN) were analyzed by VET TEST 8008 Autoanalyzer (IDEXX Laboratories, inc Westbrook ME

04092 USA). Other blood samples were freshly used for hematological analyzes (WBC, RBC, HGB, HCT, MCV, MCH, MCHC, RDWc) were analized by Abacus Junior Vet Hematology Analyzer (Diatron MI PLC. Hungary).

Statistical analysis have done using computer programme. One way ANOVA was performed to detect the differences among groups. The significance of mean differences between groups were tested by Tukey (DAWSON AND TRAPP 2001). Values were given as mean ± standard error. Level of significance was taken as $P<0.05$.

RESULTS

Analysis of Rumisacc® and Intetotal® is showed that these additives are rich in protein, they contained 44.31 and 40.51% CP respectively. Both of two dietary live yeast additive did not significantly affect for the final live weights of kids (*Table 2*). Average body weight gain, feed intake , feed convertson ratio (*Table 3*), hot and cold carcass yield (*Table 4*), ruminal ammonia-N and VFA (total and individual) concentration with Ammonia-N (*Table 5*), VFA (total and individual) concentration (*Table 6*), Initial and final hematological and blood chemistry results (*Table 7* and *Table 8*) were not significantly affected ($p>0.05$) by treatment of groups.

Table 2. Effects of dietary treatments on body weight of kids, kg

	Dietary treatments			
	C	YC	YVM	p
Initial body weight,kg	16.45 ± 0.82	16.80 ± 0.35	16.82 ± 1.22	0.939
Day 14	19.39 ± 0.86	20.03 ± 0.45	19.29 ± 1.26	0.808
Day 28	22.16 ± 1.21	22.12 ± 0.35	22.41 ± 1.49	0.866
Day 42	24.20 ±1.44	25.57 ± 0.54	24.44 ± 1.43	0.683
Day 56	27.67 ± 1.64	29.02 ± 0.47	27.43 ± 1.48	0.654
Day 70	30.15 ± 1.71	31.68 ± 0.52	29.91 ± 1.70	0.629
Day 77	30.68 ± 1.83	32.12 ± 0.52	30.98 ± 2.06	0.785

n=6, $p<0.05$

Table 3. Effects of dietary treatments on performance parameters

	Dietary treatments			
Average results	C	YC	YVM	p
Weight gain, g/d.	175.67 ± 16.59	187.59 ± 12.66	181.30 ± 22.65	0.881
Feed intake, g/d.	952.06 ± 50.57	1055.72 ± 22.33	1013.05 ± 68.96	0.325
Feed conversion ratio,(feed intake/ weight gain)	5.53 ± 0.27	5,78 ± 0,48	5,79 ± 0.53	0.889

n=6, $p<0.05$

Table 4. Effects of dietary treatments on hot and cold carcass yield

	Dietary treatments			
Item	C	YC	YVM	p
Hot carcass weight, kg	14.30 ± 0.83	14.70 ± 0.28	13.80 ± 1.00	0.706
Cold carcass weight, kg	13.86 ± 0.81	14.33 ± 0.29	13.48 ± 0.96	0.717
Hot carcass yield, %	46.62 ± 0.62	45.75 ± 0.44	44.48 ± 0.86	0.104
Cold carcass yield, %	45.21 ± 0.77	44.61 ± 0.50	43.46 ± 0.75	0.236

n=6, $p<0.05$

Table 5. Effects of dietary treatments on rumen pH and rumen -N

Rumen	Dietary treatments			
	C	YC	YVM	p
pH	5.50 ± 0.08	5.64 ± 0.07	5.53 ± 0.15	0.602
NH3-N ,mg/l	1079.33 ± 190.90	991.00 ± 53.31	992.00 ± 50.10	0.101

n=6, p<0.05

Table 6. Effects of dietary treatments on rumen volatile fatty acids (mg/l)

Item	Dietary treatments			
	C	YC	YVM	p
Lactic acid	404.89 ± 192.08	7.97 ± 5.87	70.87 ± 51.07	0.720
Acetic acid	6462.00 ± 562.66	6061.50 ± 549.76	5151.40± 515.71	0.275
Propionic acid	4315.84 ± 622.55	3365.05 ± 638.59	2260.85± 431.83	0.087
Iso-butyric acid	460.97 ± 133.15	288.39 ± 69.77	190.84 ± 83.11	0.203
n- butyric acid	1449.45 ± 211.39	1416.18 ± 178.83	1693.09± 237.20	0.620

n=6, p<0.05

Table 7. Initial hematological and blood chemistry results of kids

Item	Dietary treatment			
	C	YC	YVM	p
WBC, 10 /L	11.82 ± 1,14	12.54 ± 1,85	12.10 ± 1,17	0.937
RBC, 1012/L	17.31 ± 0,39	17.60 ± 0,42	17.85 ± 0,49	0.697
HGB, g/dl	9.21 ± 0,23	9.45 ± 0,28	9.16 ± 0,43	0.792
HCT, %	24.35±0.62	24.67 ± 0.68	23.92 ± 1.11	0.811
MCV, fl	14.00 ± 0.44	14.00 ± 0.44	13.40 ± 0.50	0.607
MCH, Pg	5.31 ± 0.13	5.36 ± 0.14	5.14 ± 0.20	0.487
MCHC, g/dl	37.86 ± 0.70	38.21 ± 0.34	38.32 ± 0.50	0.829
RDWc, %	46.60 ± 1.07	46.11 ± 1.20	47.10 ± 0.69	0.813
Total cholesterol, mmol/L	2.89 ± 0.40	2.42 ± 0.48	3.46 ± 0.42	0.298
Glucose, mmol/L	5.77 ± 0.24	5.73 ± 0.52	6.53 ± 0.50	0.395
BUN, mmol/L	3.28 ± 0.38	5.90 ± 0.98	4.48 ± 1.23	0.143
Triglycerides, mmol/L	0.22 ± 0.10	0.26 ± 0.14	0.33 ± 0.24	0.221

n=6, p<0.05

Table 8. Final hematological and blood chemistry results of kids

Item	Dietary treatment			
	C	YC	YVM	p
WBC, 10 /L	12.09 ± 1.46	13.39 ± 1.16	12.75 ± 0.71	0.739
RBC, 1012/L	17.35 ± 0.53	17.66 ± 0.49	17.77 ± 0.41	0.825
HGB, g/dl	9.21 ± 0.25	9.66 ± 0.22	9.54 ± 0.63	0.685
HCT, %	23.21 ± 0.55	24.11 ± 0.76	22.95 ± 1.41	0.655
MCV, fl	13.16 ± 0.30	13.83 ± 0.47	13.00± 0.70	0.474
MCH, Pg	5.31 ± 0.60	5.46 ± 0.13	5.36 ± 0.27	0.797
MCHC, g/dl	39.71 ± 0.43	40.11 ± 0.43	41.44 ± 0.76	0.107
RDWc, %	45.50 ± 0.14	44.61 ± 0.56	46.72 ± 1.04	0.108
Total cholesterol, mmol/L	2.17 ± 0.20	2.31 ± 0.34	1.49 ± 0.31	0.160
Glucose, mmol/L	3.64 ± 0.14	3.67 ± 0.10	3.65 ± 0.14	0.989
BUN, mmol/L	7.38 ± 0.53	7.43 ± 0.66	7.54 ± 0.56	0.983
Triglycerides, mmol/L	0.25 ± 0.01	0.29 ± 0.02	0.26 ± 0.04	0.475

n=6, p<0.05

DISCUSSION AND CONCLUSIONS

Supplementation of YC increased final weight up to 1.44 kg more without significant difference compared with control group. This case may be attributed to low numbers of animals and individual differences in body weight of the animals in the groups. It is interesting that the average daily weight gain was approximately two times higher in YVM group than in other treated groups at the final week of the experiment. Related with the average body weight gain results of this study is similar with TITTI ET AL., (2008). The investigators reported that yeast culture supplementation did not affect for the live weight, live weight gain and dry matter intake in Ivesi lambs and Shami goat kids. On the other hand significant increases in live weight gain associated with yeast supplementation have been reported in goats (KAMAL ET AL., 2013; ÖZSOY ET AL., 2013) and lambs (HADDAD AND GOUSSOUS, 2005). In the present study the kids fed diet containing either two yeast culture product consumed 11.7 and 6.38% more feed dry matter respectively than control group. Beside this result, KAMAL ET AL. (2013) reported that live yeast supplementation improved significantly the dry matter intake (DMI) per kg gain. Investigators also mentioned that more DMI and relatively more average daily gain in leave yeast fed groups subsequently lead to the improvement of the feed conversion ratio at the same study. There are several studies which have mentioned improvement in feed conversion ratio due to yeast feeding of lambs (HADDAD AND GOUSSOUS, 2005) and in goats (JINTURKAR ET AL., 2009). However TITTI ET AL. (2008), reported that yeast culture supplementation increased digestibility with no effect on growth, feed intake or feed convertion ratio of fattening Awassi lambs and Shami kids.

Very little published literature is available concerning effects of yeast culture supplementation on carcass, especially with small ruminants. TITTI ET AL., (2008), reported that yeast culture supplementation significantly decreased cold dressing proportion and hot carcass weight of Awassi lambs however did not affect on Shami goat kids as our results.

Our ruminal pH results are similar with a series of study which have shown that ruminal pH was not affected by the supplementation of *Saccharomyces cerevisiae* (GARCIA ET AL., 2000; GALIP, 2006; KAMAL ET AL., 2013). However significant increase of ruminal pH associated with yeast supplementation, have been reported in goats (ABD EL-GHANI, 2004; ÖZSOY ET AL., 2013). In the present study kids were adapted to concentrate in early age. This situation may have influence for stability of ruminal pH. Also there are investigations which have similar result (AYDIN ET AL., 2003; MOYA ET AL., 2009) are available related with *Saccharomyces cerevisiae* and ruminal fluid of ammonia-N concentration with our results. However ÖZSOY ET AL. (2013), reported that dietary inclusion of 3.0 and 4.5% live yeast culture significantly increased ammonia-N concentration on goats. Similarly, GALIP (2006a), indicated that ruminal ammonia-N concentrations increased significantly by dietary yeast culture supplementation whatever the ratio forage/concentrate of the diet. Related with VFA concentrations of ruminal fluid there is a series of study (GARCIA ET AL., 2000; AYDIN ET AL., 2003; ÖZSOY ET AL., 2013) which have similar results with ours. However KAMAL ET AL., (2013) indicated that total volatile fatty acid concentration was significantly higher in live yeast culture fed kids at 2 and 4 months.

Blood chemistry results and some hematologycal parameter results of present study had parallel with ÖZSOY ET AL. (2013). They reported that plasma cholesterol and trigliceride concentrations were not altered by yeast culture supplementation on goats and YALÇIN ET AL. (2011) on dairy cows. On the other hand, dietary yeast supplementation did not change serum trigliceride and cholesterol levels in rams (GALIP, 2006).

Addition of live yeast culture and its vitamin mineral combination to male kids fed with concentrate (without forage) did not affect for the investigated parameters significantly.

Dietary yeast culture at the level of 1% increased the final live weight (4.7%) compared with control group.

More research needs with different doses and more replicates to be conducted to determine the affects of live yeast culture products.

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