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EFFECT OF ADDITION OF LIVE YEAST CULTURE ON FATTENING PERFORMANCE ON SOME BLOOD AND RUMEN FLUID PARAMETERS IN MALE KIDS FED WİTH SUCROSE SUPPLEMENTED CONCENTRATE

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ABSTRACT
The aim of this study were to evaluate the effects of live yeast culture (LYC) as a feed additive on fattening performance, some blood and rumen fluid parameters in male goats fed with sucrose (S) supplemented concentrate. Totally 18 male Saanen goat kids were divided into three groups, no S and LYC (S(-)) as control, 3 % S (S(+)) and 3 % S plus LYC group (S+LYC), each containing 6 kids. Concentrates of groups were formulated as isonitrogenic and isocaloric. LYC (Rumisacc®, Integro Food Industry and Trade Co., İstanbul, Turkey (containing live yeast cell 344 x 10^{10} cfu per gram) was included in the concentrate at 2% as feed basis. Feeding schedule was established with only concentrate, feed was given *ad libitum* and roughage was not given. Addition of LYC plus S to concentrate increased ruminal ammonia-N and decreased ruminal pH compeared with sucrose unsupplemented control group. Addition of live yeast culture and sucrose did not affect fattening performance and blood parameters significantly on $P<0.05$ except HGB and HCT.

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

INTRODUCTION

Grain feeding can sometimes be a controversial topic among goat and sheep producers. Some producers feed a lot of grain to their livestock, while others do not feed any grain at all. The decision to feed grain should be based primarily on economics, including marketing advantages realized by not feeding grain or by feeding grain (SCHOENİAN, 2014).

Live yeast cultures as microbial feed additives have been used in ruminant nutrition as rumen fermentation stimulant or performance enhancer. To avoid grain sickness, it is important that animals digestive system are allowed to gradually adapt to the grain. On the other hand microbial feed additives can be used for this adaptation period.

DESNOYERS ET AL., (2009), indicated that the positive effect of yeast supplementation on rumen VFA concentration increased with dry matter intake and crude protein levels. Related with active dryed yeasts in young ruminants, CHAUCHEYRAS-DURAND ET AL., (2008) also mentioned that yeast have an stabilization function on rumen pH.

However supplementation of yeast culture in diets of ruminants had conflicting results on rumen fatty acid (VFA) concentration (DOLEZAL ET AL., 2005; ÖZSOY ET AL., 2013). 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 (YALÇİN ET AL., 2011).

For many years, scientists have shown greater interests in manupulating the microbial ecosystem of the rumen to improve production efficiency by domestic ruminants. The benefits of live yeast culture are well understood however researchs in small ruminants are limited. Resent investigations indicated that addition of *Saccharomyces cerevisiae* live

yeast cultures has improved live weight gain (ÖZSOY ET AL., 2013; KAMAL ET AL., 2013), dry matter intake (KAMAL ET AL., 2013) and feed conversion ratio (HADDAD AND GOUSSOUS, 2005; JİNTURKAR ET AL., 2009), incresed ruminal pH (ÖZSOY ET AL., 2013; ABD EL-GHANİ, 2004) in small ruminants.

The purpose of feeding grain to livestock is to provide nutrients that the forage part of the diet is not providing. For example, forage diets often cannot meet the nutritional needs of lambs and kids with the genetic potential for rapid growth. For this reason, supplements are often provided to enable livestock to reach their genetic potential for growth (SCHOENİAN, 2014).

One of the prefered dairy goat species is Saanen in Turkey. Male kids have less economic value for dairy farms in birth season when compeared with femails. They are generally fed with forages by the families and slaughtered without getting economic value. Effects of supplementing live yeast culture (Rumisacc® 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 live yeast culture supplementation to fattening diets of male Saanen kids on feed intake, growth performance, some blood parameter and ruminal volatile fatty acids.

MATERIAL AND METOD

The animals used in this experiment were cared for in accordince with the guidelines from the Veterinary Faculty of Mehmet Akif Ersoy University regulations for care and treatments of animals.

A total of 18 male Saanen kids aged 1months 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 21 weeks from April 2013 to August 2013.

Kids were housed individual cages (2m x 3m) under the shed with concrete floor with sawdust and dryed manure as bedding material for the entire period of the experiment. Saanen goat kids were divided into three groups, no S and LYC (S(-)) as control, 3 % S (S(+)) and 3 % S plus LYC group (S+LYC), each containing 6 kids.Concentrates were prepared as a mash feed. LYC (Rumisacc®, Integro Food Industry and Trade Co., İstanbul, Turkey; Live yeast cell 344 x 10^8 cfu per gram) was included in the concentrate at 2% on feed basis.Feeding schedule was established with only concentrate, feed was given *ad libitum* and roughage was not given.

The ingredients and the chemical composition of the concentrates are presented in *Table 1*.

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

	Dietary treatments		
Ingredients, % as feed basis	**S(-)**	**S(+)**	**S+LYC**
Corn	35.5	30	30
Barley	24	25	25
Wheat Bran,	9	10	10
Full fat soy	15	13	13
Sunflover meal, 36 % Crude Protein	9.5	10	10
Soybean meal, 48 % Crude protein	7	6	6
DCP	2	2	2
Canola oil	3	3	3
DL-methionine	0.2	0.2	0.2
L-Lizin hidrochloride	0.2	0.2	0.2
Sucrose	-	3	3
Live yeast culture[1]	-	-	2
Lime stone	1	1	1
Salt	0.4	0.4	0.4
Vitamin mineral premix[2]	0.2	0.2	0.2
Analysed composition, % as feed basis			
Dry matter, %	91.77	92.15	92.27
Crude protein, %	15.40	15.11	15.35
Ether extract, %	5.70	5.44	5.81
ME, kcal/kg ME	2806.19	2794.70	2830.03

CON: 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 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

Live yeast culture (Rumisacc®, Integro food Industry and Trade Co., Istanbul, Turkey) was included in the concentrates at 2,0 %. During the study concentrates and fresh water were given *ad libitum* and the ration was not containing roughage. Feed refusals were collected once a week and weighed to accuretly determine to dry matter 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.

Animals were individually weighed at the beginning of the experiment and every two weeks. The 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. Rumen fluid sample in one bottle was used for the measurement of pH and other 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^{o}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^oC. Concentrations of ammonia-N were determined by distillation (Gerhard, vapodest 2000) and titration, by using 5 ml of the rumen fluid which filtered by from cheese cloth (ANONYMUS, 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 centrifugalized at 3000 rpm at room temperature for 5 minutes and then serum was carefully harvested for determination of total cholesterol, triglyceride, glucose and blood urea nitrogen (BUN) were analyzed by VET TEST 8008 Autoanalyzer (IDEXX Laboratories, inc Westbrook ME 04092 USA).

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

Statistical analysis has 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

Protein analysis of live yeast culture (Rumisacc®) showed that it is rich in protein content (44.31%). Other results of analysis, dry matter, crude ash, eter extract and crude fibre ingradients are 93.45; 11.65; 3.89 and 3,07% respectively.

Dietary live yeast supplementation did not significantly affect live weight *(Table 2)* and live weight gain of kids during the study. Interestingly the live weight gain of S+LYC has developed more stable than the other groups. Dietary live yeast culture significantly ($p<0,05$) increased live weight gain compeared with other groups at the hot (middle of summer) final weeks of the study however this result was not reflected to avarage live weight gain at the end of the experiment.

Avarage feed intake and feed conversion ratio were not significantly affected by dietary treatments *(Table 3).* In the present study kids fed diet containing live yeast culture fed more feed than the control group at the first 4 week of the experiment. On the other live yeast supplemented group consumed less feed than control group in significantly during the study - except final week of the experiment.

Live yeast culture did not affect hot and cold carcass yield significantly compeared with other groups (*Table 4).* In the present study ruminal pH of sucrose supplemented both S(+) and S+LYC groups were negatively affected ($p<0,05$).

Also for the same groups the ruminal ammonia-N concentration were significantly increased ($p<0,05$) compeared with unsupplemented Suc (-) CON group (*Table 5*).

In the present study initial (*Table 6*) and final (*Table 7*) blood chemistry results of total cholesterol, glucose, trigliceride, BUN and some hematologycal parameters were not altered -except HGB and HCT- by dietary live yeast culture supplementation.

Ruminal VFA concentrations (*Table 8*) were not affected by dietary inclusion of live yeast culture or sucrose.

Table 2. Effects of dietary treatments on body weight (BW),kg.

Days	Dietary treatments			p
	S(-)	S(+)	S+LYC	
Initial BW, kg	8850.00 ± 681.66	9241.66 ± 652.10	9790.00 ± 620.16	0.622
Day 14	10416.66 ± 817.38	10933.33 ± 633.59	11520.00 ± 659.46	0.578
Day 28	12800.00 ± 978.34	13391.66 ± 934.38	13330.00 ± 720.86	0.876
Day 42	15025.00 ± 921.75	15341.66 ± 1164.00	14930.00 ± 589.61	0.951
Day 56	17658.33 ± 1049.08	17141.66 ± 1240.12	16530.00 ± 568.02	0.757
Day 70	19800.00 ± 1241.16	18175.00 ± 1461.26	17790.00 ± 465.67	0.514
Day 84	23366.66 ± 1345.03	20416.66 ± 1889.95	20320.00 ± 865.10	0.283
Day 98	26058.33 ± 1834.32	22175.00 ± 1982.62	23670.00 ± 1272.06	0.264
Day 112	25816.66 ± 1483.95	22400.00 ± 2012.95	25060.00 ± 968.42	0.304
Day 119	25841.66 ± 1443.68	24458.33 ± 2304.82	26280.00 ± 1022.08	0.749

n=6, p<0.05

Table 3. Effects of dietary treatments on performance parameters

Avarage results	Dietary treatments			p
	S(-)	S(+)	S+LYC	
Weight gain, g/d	142.78 ± 11.13	127.87 ± 16.25	138.57 ± 8.63	0.694
Feed intake, g/d	753.76 ± 37.77	735.72 ± 41.97	714.09 ± 27.50	0.766
Feed conversion ratio, (Feed intake/weight gain)	5.33 ± 0.19	6.07 ± 0.55	5.20 ± 0.55	0.249

n=6, p<0,05

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

Item	Dietary treatments			p
	S(-)	S(+)	S+LYC	
Hot carcass weight, kg	12.26 ± 0.72	10.93 ± 1.26	12.28 ± 0.54	0.512
Cold carcass weight, kg	12.03 ± 0.72	10.63 ± 1.24	12.16 ± 0.54	0.447
Hot carcass yield, %	47.44 ± 0.62	44.28 ± 1.13	46.76 ± 1.31	0.102
Cold carcass yield, %	46.53 ± 0.71 a	43.04 ± 1.21 b	46.30 ± 1.23 a	0.060

n=6, p<0.05

Table 5. Effects of dietary treatments on rumen pH and rumen -NH_3- N

Item	Dietary treatments			p
	S(-)	S(+)	S+LYC	
Rumen pH	6.35 ± 0.20 a	5.79 ± 0.07 b	5.70 ± 0.15 b	0.021
	S(-)	**S(+)**	**S+LYC**	**p**
Rumen NH_3-N,mg/l	686.56 ± 105.06 b	1134.56 ± 94.21 a	1143.85 ± 77.33 a	0.004

p<0.05

Table 6. Initial hematological and blood chemistry results of kids

Item	Dietary teratment			p
	S(-)	S(+)	S+LYC	
WBC, 10^9 /L	10.76 ± 2.09	9.92 ± 0.99	12.65 ± 2.31	0.591
RBC, 10^{12}/L	17.09 ± 0.47	16.75 ± 0.52	16.20 ± 0.47	0.480
HGB, g/dl	8.20 ± 0.38	7.53 ± 0.28	7.66 ± 0.51	0.446
HCT, %	22.23 ± 1.33	20.39 ± 0.43	20.78 ± 1.12	0.422
MCV, fl	12.83 ± 0.47	12.16 ± 0.30	12.60 ± 0.40	0.493
MCH, Pg	4.80 ± 0.14	4.51 ± 0.13	4.70 ± 0.18	0.423
MCHC, g/dl	37.11 ± 0.70	36.90 ± 0.72	36.78 ± 0.60	0.942
RDWc, %	48.30 ±0.88	49.60 ± 0.72	47.36 ± 0.74	0.179
Total cholesterol , mmol/L	4.77 ± 0.52	3.69 ± 0.37	3.53 ± 0.43	0.142
Glucose, mmol/L	4.27 ± 0.42	5.02 ± 0.74	5.75 ± 0.88	0.353
BUN, mmol/L	5.03 ± 0.63	4.21 ± 0.43	4.42 ± 0.44	0.517
Triglceride, mmol/L	0.24 ± 0.03	0.18 ± 0.04	0.38 ± 0.49	0.089

n=6, $p<0.05$

Table 7. Final hematological and blood chemistry results of kids

Item	Dietary teratment			p
	S(-)	S(+)	S+LYC	
WBC, 10^9 /L	12.73 ± 2.88	10.90 ± 1.02	11.25 ± 1.07	0.777
RBC, 10^{12}/L	18.65 ± 0.57	17.20 ± 0.57	17.40 ± 0.70	0.217
HGB, g/dl	10.60 ± 0.37 a	9.03 ± 0.28 b	9.34± 0.52 b	0.027
HCT, %	27.57 ± 0.71 a	24.10 ± 0.79 b	25.35 ± 1.12 ab	0.034
MCV, fl	14.66 ± 0.42	14.16 ± 0.47	14.80 ± 0.58	0.636
MCH, Pg	5.68 ± 0.08	5.25 ± 0.11	5.36 ± 0.19	0.083
MCHC, g/dl	38.41 ± 0.65	37.58 ± 0.91	37.09 ± 1.01	0.565
RDWc, %	44.80 ± 1.28	45.40 ± 0.79	44.60 ± 1.08	0.863
Total cholesterol, mmol/L	3.11 ± 0.41	2.52 ± 0.28	2.05 ± 0.12	0.104
Glucose, mmol/L	4.02 ± 0.32	4.45 ± 0.24	4.08 ± 0.23	0.496
BUN, mmol/L	6.66 ± 0.49	7.96 ± 0.68	6.80 ± 0.34	0.207
Trigliceride, mmol/L	0.38 ± 0.06	0.29 ± 0.02	0.26 ± 0.03	0.222

n=6, $p<0.05$

Table 8. Effects of dietary treatments on volatile fatty acids of ruminal fluid (mg/l)

Item	Dietary teratment			p
	S(-)	S(+)	S+LYC	
Lactic acid[1]	44.39 ± 19.00	6737 ± 17.94	63.86 ± 17.96	0.647
Acetic acid[1]	1062.79 ± 195.56	1087.32 ± 323.58	1921.59 ± 232.00	0.116
Propyonic acid[1]	406.79 ± 130.90	1475.43 ± 416.96	1251.76 ± 227.19	0.119
n-butyric acid[1]	264.32 ± 65.02	338.41 ± 61.68	477.03 ± 129.34	0.284
Iso-butyricacid[1]	20.48 ± 4.11	33.50 ± 17.88	81.59 ± 38.51	0.190

[1]Results of formic acid used analysis n=6, $p<0.05$

DISCUSSION AND CONCLUSIONS

Avarage live weight gain results of present study is not statistically different among groups. It is similar with the study in lambs and goat kids (TİTTİ ET AL., 2008). However there is a series of study in goats (ÖZSOY ET AL., 2013; KAMAL ET AL., 2013) and in lambs (HADDAD AND GOUSSOUS, 2005), which were reported that live yeast supplementation increased live weight gain. Related with feed intake and feed converision ratio results KAMAL ET AL., (2013) reported that live yeast supplementation significantly improved dry matter intake (DMI) per kg gain. There is several studies which have mentioned improvement in feed conversion ratio due to yeast feeding in lambs (HADDAD AND GOUSSOUS, 2005) and in goats (JİNTURKAR ET AL., 2009). However TİTTİ ET AL., (2008), reported that yeast culture supplementation incresed digestibility with no effect on growth, feed intake or feed conversion ratio of fattening Awassi lambs and Shami kids.

Hot and cold carcass yield parameters are similar with TİTTİ ET AL., (2008) which reported that yeast culture supplementation did not affect cold dressing proportion and hot carcass weight of Shami goat kids.

Studies that have examined effects of yeast cultures on ruminal pH have reported variable results. In contrast to the results of ours, significant increases in ruminal pH associated with yeast supplementation have been reported in goats (ÖZSOY ET AL., 2013; ABD EL-GHANİ, 2004). On the other hand a series of study which have shown that ruminal pH was not affected by the supplementation of *Saccharomyces cerevisiae* (KAMAL ET AL., 2013; GALİP, 2006A; GARCİA ET AL., 2000). This difference may be attributed to composition of the rations and strain of the yeast culture. In the present study kids were adapted to concentrate in early age, this situation may have influence the S(-) group's ruminal pH stability.

Ruminal ammonia-N results of present study is similar with several studies which reported that ruminal ammonia-N concentrations were significantly increased by dietary yeast culture supplementation on goats (ÖZSOY ET AL., 2013) and on rams (GALİP, 2006B). However AYDİN ET AL., (2003) and MOYA ET AL., (2009) reported that dietary yeast culture supplementation did not affect ruminal ammonia-N concentration on sheeps and heifers respectively.

Our final blood chemistry results are similar with the studies on goats (ÖZSOY ET AL., 2013) related with plasma cholesterole and trigliceride concentrations and on dairy cows (YALÇİN ET AL., 2011) related with plasma glucose, cholesterole and trigliceride concentrations. On the other hand, dietary yeast supplementation did not change serum trigliceride and cholesterole levels in rams (GALİP, 2006A).

There is a series of study (ÖZSOY ET AL., 2013; AYDİN ET AL., 2003; GARCİA ET AL., 2000) which have similar results with ruminal fluid VFA concentration of the present study. 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 of age.

It is concluded that addition of live yeast culture at the level of 2% to 3% sucrose supplemented concentrate increased ruminal ammonia-N and decreased ruminal pH compared with sucrose unsupplemented group.

More reasearch needs with more replicates to be conducted to determine the affects of live yeast culture on kids.

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