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The Effect of Live Yeast, (*Saccharomyces cerevisiae*) Supplementation on Some Blood Biochemical Indicators of Barbari and Sirohi Goats

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ABSTRACT

This study was conducted to evaluate the effect of supplementing different levels of probiotics (*Saccharomyces cerevisiae*) to assess the effect on some biochemical parameters, in Barbari and Sirohi goats. Twenty four (24) Barbari and twenty four (24) Sirohi kids divided into four groups. Just after weaning at the age of 2-3 month of either sex were selected and distributed randomly in different groups. Group 1 fed Grazing + concentrate feeding (@ 100 g/day/kid) (T_1), Group 2 T_1 + *S. cerevisiae* (@ 2 g/animal /day) (T_2) and Group 3 T_1+ @ 50 g extra concentrate feeding (T_3), Group 4 T_1+50 g extra concentrate feeding +*S. cerevisiae* (@ 2 g/animal / day) (T_4). The final observation on blood glucose of Barbari kids 83.5 ± 2.23, 82.58 ± 2.75, 76.42 ± 3.85 and 83.67 ± 2.55 in Sirohi kids 76.42 ± 2.87, 79.42 ± 3.29, 82.17 ± 3.49 and 77.33 ± 3.35 mg/dl and observation on serum total protein of Barbari kids were lastly observe 6.91 ± 0.22, 7.11 ± 0.25, 7.24 ± 0.17 and 6.98 ± 0.14 in Sirohi kids 6.64 ± 0.65, 7.36 ± 0.3, 6.88 ± 0.14 and 7.11 ± 0.29 g/dl. The mean value of serum albumin (g/dl) of Barbari kids were culminating to 3.11 ± 0.28, 3.07 ± 0.22, 3.4 ± 0.26 and 3.1 ± 0.4. In Sirohi kids 3.08 ± 0.36, 2.62±0.28, 3.53 ± 0.33 and 2.92 ± 0.22 g/dl. Mean value of serum globulin (g/dl) of Barbari kids were culminating to 4.42 ± 0.51, 4.04 ± 0.3, 3.84 ± 0.32 and 3.87 ± 0.48 in Sirohi kids 3.56 ± 0.86, 4.74 ± 0.44, 3.35 ± 0.39 and 4.19 ± 0.36 g/dl. The mean value of albumin globulin ratio (%) of Barbari kids were culminating 0.98 ± 0.16, 0.83 ± 0.1, 1.04 ± 0.18 and 0.85 ± 0.25 in Sirohi kids 0.92 ± 0.48, 1.34 ± 0.25, 1.31 ± 0.21 and 0.77 ± 0.09 to % respectively for T_1, T_2, T_3 and T_4 group at the end of experiment.

Keywords Barbari and Sirohi goat, Biochemical parameters, *Saccharomyces cerevisiae*.

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INTRODUCTION

Probiotics improve nutrient absorption (Teeler and Vanabelle 1991), reduce the incidence of intestinal infection (Casas and Dobrogosz 2000) and restore the gut micro flora in case of diarrhoea (Musa *et al.*

2009). Known to increase ruminal pH (Umberger and Notter 1989), total volatile fatty acids (VFAs) and ruminal biomass (Newbolt *et al.* 1996) and thus influence the cellulolytic activity and microbial protein synthesis and fiber degradation (Martin and Nisbet 1990, Yoon and Stern 1996). Yeast cultures usually contain the living yeast cells of *Saccharomyces cerevisiae* in concentrations of at least 10 billion colonies per gram. They have been recently used as a probiotic in the diets of ruminants to create a more advantageous rumen environment for anaerobic, cellulolytic bacteria and to support their growth and activity. It is also considered that they compete with other pathogenic micro-organisms for the provision of nutrients and other growth factors (Rolfe 2000). They enhance immunity (Aattouri *et al.* 2001) by promoting the antibodies, IgA and cytokines production (Trebichavsky and Splichal 2006). Optimum weight gain and good animal health depend on stabilization of the rumen environment. Our earlier findings indicated an influence of living yeast diet supplementation on increased expression of genes encoding the antimicrobial peptides β2- defensin, bactenecin 7.5 and hepcidin in goat body somatic cells. Therefore, this might confirm the role of this food additive in maintaining the health status of the goats. Positive effects of probiotics on the rumen environment and performance of ruminants have been intensively studied because they can beneficially modify microbial activities, fermentative and digestive functions in the rumen. It is further stated that probiotics can stimulate specific groups of beneficial bacteria in the rumen and has provided mechanistic models that can explain their effects on animal performance (Dutta *et al.* 2009).

MATERIALS AND METHODS

Twenty four (24) Sirohi and twenty four (24) Barbari male and female kids were randomly selected from the Institute's flock for the study. Every care was taken while selecting the animals, so that they had equal body weight and almost same age. These animals were randomly distributed into four different groups (6 kids in each group), i.e., Treatment - 1 (Control) (T_1), Treatment-2 (T_2), Treatment-3 (T_3) and Treatment-4 (T_4) all the groups received the same basal ration.

Experimental station

Proposed work was conducted at Livestock Farm, Amanala, College of Veterinary Science and AH, Jabalpur, NDVSU, Jabalpur (MP). The farm is situated on the tropics of cancer on 80° longitudes and at an elevation of 410.8 meters above the mean sea level. The climate of the region is light tropical, sub-humid with a seasonal variation in temperature ranging from 5.6°C to 44.0°C and an average annual rainfall of 1,415 mm.

Composition of basal ration (18% DCP and 70% TDN)

Ingredients/100 kg	Percentage
Crushed maize	45
Ground nut cake	30
Arharchuni	17
Wheat bran	15
Mineral mixture	2
Salt	1

Experimental design

Groups	No. of animals	Feeding with 5-6 h grazing
(Control)		
T_1	6 Barbari + 6 Sirohi kids of 3-4 months of age	Grazing+concentrate feeding (@ 100 g/day/kid)
T_2	6 Barbari + 6 Sirohi of 3-4 months of age	T_1 + *S. cerevisiae* (@ 2 g/animal / day)
T_3	6 Barbari + 6 Sirohi kids of 3-4 months of age	T_1+ @ 50 g extra concentrate feeding
T_4	6 Barbari + 6 Sirohi of 3-4 months of age	T_1 + 50 g extra concentrate feeding + *S. cerevisiae* (@ 2 g / animal /day)

Table 1. Average monthly blood glucose level of Barbari and Sirohi kids.

Months/ Breed	T_1 Barbari	Sirohi	T_2 Barbari	Sirohi	T_3 Barbari	Sirohi	T_4 Barbari	Sirohi
Initial	57.83±2.55	57.83±2.55	63.00±2.28	63.00±2.28	72.00±3.2	72.00±3.2	75.83±5.11	75.83±5.11
1	66.75±3.91	60.25±2.23	72±3.8	62.92±2.84	65.67±2.31	64.92±4.18	66.67±2.96	60.92±2.76
2	72.08±3.03	77.08±2.6	71.42±3.15	71.58±4.19	74.08±4.18	73.08±3.61	72.08±3.8	66.5±3.76
3	77.83±2.91	75.58±3.22	67.92±3.25	76.42±2.91	82.5±3.62	74.58±3.42	74.25±3.42	80.42±2.99
4	79.67±3.22	78.08±3.32	74.08±2.89	80±3.1	79.67±2.91	82.5±3.1	79.83±1.74	82±3.04
5	79.25±3.52	81.92±1.96	76.67±2.97	73.5±3.53	82.17±2.4	75.58±3.97	80.75±2.94	77.67±4.24
6	81.83±1.85	83.25±2.51	80.75±2.47	81.67±3.21	80±2.43	81.5±3.25	77.83±2.99	77.67±3.34
7	83.5±2.23	76.42±2.87	82.58±2.75	79.42±3.29	76.42±3.85	82.17±3.49	83.67±2.55	77.33±3.35

Housing and management

At the experiment and throughout the experiment period healthy surrounding and proper cleanliness was maintained in the experimental shed. In the experimental period both groups were offered almost similar type feeding schedule and probiotics treatment in order to observe the effect of probiotics (*S. cerevisiae*) on performance in Indian goats (Sirohi and Barbari breed).

RESULTS AND DISCUSSION

Blood glucose

The observation on blood glucose of Barbari kids are shown in table. The mean value of blood glucose (mg/dl) of Barbari kids at the onset of the experiment were 57.83±2.55, 63.00±2.28, 72.00±3.2 and 7 5.83±5.11 in Sirohi kids 57.83 ± 2.55, 63.00 ± 2.28, 72.00±3.2 and 75.83 ± 5.11 which increased to 83.5±2.23 82.58±2.75, 76.42 ± 3.85 and 83.67 ± 2.55 in Sirohi kids 76.42 ± 2.87, 79.42 ± 3.29, 82.17 ± 3.49 and 77.33 ± 3.35 mg/dl for T_1, T_2, T_3 and T_4 group at the end of experiment respectively. Average monthly blood glucose level is shown in Table 1.

Serum total protein

The observation on serum total protein of Barbari and Sirohi kids are presented in table. The mean value of serum total protein (g/dl) of Barbari kids at the onset of the experiment were 6.94±0.55, 7.03 ± 0.27, 7.11 ± 0.26 and 7.06 ± 0.2 in Sirohi kids 5.88 ± 0.59, 3.56 ± 0.24, 5.73 ± 1.14 and 6.54 ± 1.31 which were lastly observe 6.91 ± 0.22, 7.11 ± 0.25, 7.24 ± 0.17 and 6.98 ± 0.14 in Sirohi kids 6.64 ± 0.65, 7.36 ± 0.3, 6.88 ± 0.14 and 7.11 ± 0.29 g/dl for T_1, T_2, T_3 and T_4 group respectively at the end of experiment. Average monthly serum total protein count is shown in Table 2.

Table 2. Average monthly serum total protein count of Barbari and Sirohi kids.

Months/ Breed	T_1 Barbari	Sirohi	T_2 Barbari	Sirohi	T_3 Barbari	Sirohi	T_4 Barbari	Sirohi
Initial	6.94±0.55	5.88±0.59	7.03±0.27	3.56±0.24	7.11±0.26	5.73±1.14	7.06±0.2	6.54±1.31
1	7.06±0.41	6.46±0.63	6.37±0.48	6.45±0.36	7.6±0.45	7.3±0.2	6.89±0.15	6.94±0.22
2	7.38±0.2	7.32±0.15	6.98±0.3	7.23±0.24	7.12±0.23	7.52±0.2	7.11±0.23	7.71±0.22
3	6.95±0.18	5.51±0.54	7.44±0.24	7.31±0.31	7.02±0.18	6.62±0.47	7.32±0.22	6.5±0.7
4	7.1±0.23	7.22±0.22	7.17±0.2	7.49±0.23	7.38±0.21	7.29±0.18	7.4±0.13	7.47±0.21
5	6.79±0.11	6.6±0.4	7.07±0.21	7.2±0.55	6.73±0.19	6.56±0.35	6.9±0.11	7.18±0.17
6	7.2±0.12	7.45±0.22	7.13±0.18	7.15±0.16	6.98±0.17	7.36±0.19	7.01±0.22	7.4±0.31
7	6.91±0.22	6.64±0.65	7.11±0.25	7.36±0.3	7.24±0.17	6.88±0.14	6.98±0.14	7.11±0.29

Table 3. Average monthly serum albumin count of Barbari and Sirohi kids.

Months/ Breed	T_1 Barbari	T_1 Sirohi	T_2 Barbari	T_2 Sirohi	T_3 Barbari	T_3 Sirohi	T_4 Barbari	T_4 Sirohi
Initial	2.54±0.35	1.91±0.27	2.43±0.34	2.34±0.27	2.9±0.42	2.51±0.31	3.61±0.54	2.53±0.51
1	3.88±0.26	4.28±0.21	3.26±0.32	3.93±0.15	3.12±0.15	3.84±0.15	2.75±0.34	4±0.17
2	4.11±0.2	2.26±0.17	3.1±0.3	2.33±0.32	2.86±0.34	2.83±0.19	3.83±0.26	2.83±0.34
3	2.78±0.26	3.38±0.23	3.39±0.39	4.4±0.18	3.49±0.27	3.52±0.25	2.98±0.41	2.51±0.26
4	3.37±0.34	2.69±0.34	3.15±0.31	2.95±0.33	2.94±0.28	2.86±0.29	2.88±0.4	3.31±0.32
5	2.92±0.39	3.13±0.31	2.79±0.27	3.13±0.33	3.22±0.23	3.54±0.18	3.04±0.36	2.32±0.3
6	2.95±0.39	3.73±0.29	3.65±0.24	3.85±0.18	2.78±0.3	3.94±0.15	2.98±0.39	3.35±0.36
7	3.11±0.28	3.08±0.36	3.07±0.22	2.62±0.28	3.4±0.26	3.53±0.33	3.1±0.4	2.92±0.22

Serum albumin

The mean value of serum albumin (g/dl) of Barbari kids at the start of the experiment were 2.54±0.35, 2.43±0.34, 2.9±0.42 and 3.61±0.54 in Sirohi kids 1.91±0.27, 2.34±0.27, 2.51±0.31 and 2.53±0.51 which were culminating to 3.11±0.28, 3.07±0.22, 3.4±0.26 and 3.1±0.4 in Sirohi kids 3.08±0.36, 2.62±0.28, 3.53±0.33 and 2.92±0.22 g/dl respectively for T_1, T_2, T_3 and T_4 group respectively. Average monthly serum albumin count is shown in Table 3.

Serum globulin

The mean value of serum globulin (g/dl) of Barbari kids at the start of the experiment were 4.4±0.77, 4.6±0.25, 4.2±0.58 and 3.46±0.44 in Sirohi kids 4.42±0.51, 1.15±0.24, 3.21±1.15 and 4.01±1.04 which were culminating to 4.42±0.51, 4.04±0.3, 3.84±0.32 and 3.87±0.48, in Sirohi kids 3.56±0.86, 4.74±0.44, 3.35±0.39 and 4.19±0.36 g/dl respectively for T_i, T_2, T_3 and T_4 group respectively. Average monthly serum globulin is shown in Table 4.

Serum albumin globulin ratio

The mean value of albumin globulin ratio (%) of Barbari kids at the start of the experiment were 0.99±0.49, 0.55±0.09, 0.84±0.22 and 0.82±0.17,in Sirohi kids 0.57±0.13, 2.51±0.74, 1.44±0.43 and 0.85±0.25 which were culminating 0.98±0.16, 0.83±0.1, 1.04±0.18 and 0.85±0.25 in Sirohi kids 0.92±0.48, 1.34±0.25, 1.31±0.21 and 0.77±0.09 to % respectively for T_1, T_2, T_3 and T_4 group. Average monthly serum albumin globulin ratio count t is shown in Table 5.

Effect of probiotics on serum total protein, albumin and globulin

Mousa *et al.* (2012) made three groups of 21 selected Rahmani ewes and fed with live dried yeast and

Table 4. Average monthly serum globulin count of Barbari and Sirohi kids.

Months/ Breed	T_1 Barbari	T_1 Sirohi	T_2 Barbari	T_2 Sirohi	T_3 Barbari	T_3 Sirohi	T_4 Barbari	T_4 Sirohi
Initial	4.4±0.77	4.42±0.51	4.6±0.25	1.15±0.24	4.2±0.58	3.21±1.15	3.46±0.44	4.01±1.04
1	3.18±0.45	2.17±0.66	3.11±0.33	2.53±0.4	4.48±0.51	3.47±0.21	4.14±0.37	2.94±0.28
2	3.27±0.28	5.06±0.25	3.88±0.4	4.89±0.36	4.25±0.44	4.69±0.2	3.28±0.32	4.89±0.4
3	4.17±0.34	2.13±0.59	4.05±0.42	2.9±0.4	3.53±0.29	3.1±0.49	4.34±0.36	3.98±0.7
4	3.73±0.36	4.53±0.37	4.02±0.28	4.55±0.4	4.44±0.36	4.43±0.31	4.52±0.41	4.16±0.4
5	3.87±0.4	3.46±0.33	4.29±0.25	4.07±0.64	3.51±0.29	3.02±0.35	3.86±0.42	4.86±0.29
6	3.8±0.4	3.72±0.45	3.48±0.31	3.3±0.22	4.2±0.34	3.42±0.19	4.03±0.41	4.05±0.48
7	4.42±0.51	3.56±0.86	4.04±0.3	4.74±0.44	3.84±0.32	3.35±0.39	3.87±0.48	4.19±0.36

Table 5. Average monthly serum albumin globulin ratio count of Barbari and Sirohi kids.

Months/ Breed	T_1 Barbari	T_1 Sirohi	T_2 Barbari	T_2 Sirohi	T_3 Barbari	T_3 Sirohi	T_4 Barbari	T_4 Sirohi
Initial	0.99±0.49	0.57±0.13	0.55±0.09	2.51±0.74	0.84±0.22	1.44±0.43	0.82±0.17	0.85±0.25
1	69.32±0.88	1.22±0.65	1.21±0.18	6.99±4.99	0.79±0.09	1.17±0.11	1.43±0.26	1.57±0.22
2	1.44±0.21	0.48±0.06	1.05±0.24	0.56±0.12	0.82±0.15	0.63±0.06	0.83±0.18	0.7±0.15
3	0.77±0.12	0.62±0.98	1.04±0.2	1.88±0.27	1.13±0.18	0.19±1.31	0.81±0.19	1.16±1.82
4	1.11±0.21	0.71±0.14	0.88±0.14	0.77±0.14	0.75±0.11	0.73±0.11	1.06±0.25	0.94±0.15
5	1.16±0.39	1.13±0.22	0.7±0.09	1.09±0.21	1.04±0.14	1.71±0.49	0.96±0.22	0.54±0.1
6	0.93±0.21	1.25±0.21	1.24±0.22	1.34±0.25	0.76±0.12	1.21±0.11	1.34±0.47	1.12±0.24
7	0.98±0.16	0.92±0.48	0.83±0.1	1.34±0.25	1.04±0.18	1.31±0.21	0.85±0.25	0.77±0.09

reported that dried yeast supplementation significantly increased ($p < 0.05$) albumin concentration while blood total protein, globulin whereas A : G are not affected. Similarly Kholif (2001), Khattab *et al.* (2003), Mahrous and Abou-Ammou (2005) for goats and Komona (2007) in sheep found that yeast culture supplementation did not affect blood A : G ratio.

Kumar *et al.* (2013) worked on twenty four pre-weaning Barbari kids were divided into two groups. The experimental groups were as under, K_1= Control (no probiotics) and K_2=*Lactobacilli* culture as probiotics (9×10^6 cfu/d/ kid). Feeding schedule was similar for both the groups. Total DMI, CP intake per unit body weight and CP percentage were similar between control und treatment groups they reported that total protein (g/dl) and globulins (g/dl) tended to increase in K_2 (7.21 and 3.55) than K_1(6.39 and 2.96) group, but the differences were similar. Glucose concentration (g/dl), albumin (g/dl) and A/G ratio in the blood plasma were similar between two groups.

Ghazanfar *et al.* (2015) studied the effect of effect YC on dairy heifer they reported that the average daily weight gain was higher ($p < 0.05$) in yeast supplemented group compared with control group. Yeast-supplementation increased ($p < 0.05$) the eosinophil's and Hemoglobin levels and erythrocytes and leukocytes counts.

El-Mehanna *et al.* (2017) studied the effect of probiotic, rebiotic and synbiotic on sub-tropical noemi lambs. The results indicated that treatment had no effects on hematological parameters, except leukocytes number which was elevated ($p < 0.05$) in all treated lambs compared to control lambs. Treatments had no effect on blood serum cholesterol, whereas treatment with probiotic and synbiotic increased ($p < 0.05$) blood serum glucose. Blood serum insulin and IGF-I concentrations were higher ($p < 0.05$) in lambs given synbiotic than lambs in other groups. Different supplementations improved ($p<0.05$) finishing weight of lamb as compared to control.

Effect of probiotics on blood glucose

Mousa *et al.* (2012) reported that dried yeast supplementation to the 2–4 years old ewes resulted in significantly increased ($p < 0.05$) glucose concentration. Similar findings were found by Talha (1996) and Abdel-Khalek *et al.* (2000).

Mohammed *et al.* (2013) studied the effect blood metabolite in goats and found that dietary supplements had no significant effect on tested biochemical parameters of all groups compared to the control group.

Deng *et al.* (2016) treated one hundred pregnant Holstein cows with lyophilized culture mixture of three *Lactobacillus strains* composed of *Lactobacillus sakei* FUA 3089 and *Pediococcus acidilactici* FUA 3138 and FUA 3140 as intravaginal infusion. They found that intravaginal probiotic infusion around calving resulted in a significant increase in the concentration of cholesterol in the serum of dairy cows. The intravaginal probiotic infusion also resulted in increased serum lactate in treated cows but the serum NEFA was lower in treated cows.

Gyenai *et al.* (2016) conducted a study to evaluate the effects or probiotics administration on gastrointestinal parasites *Coccidia, Haemonchus contortus* and markers of infection. They found that daily drenching of three months-old male Spanish Boer kid-goats (n = 3) with a cocktail of probiotics mix till four weeks of age showed no difference in FAMACHA scores, PCV, WBCDC, PGE2 and IgE between probiotics drenched and control animals.

CONCLUSION

Blood biochemical parameters are commonly used to assess the nutritional and physiological status of animals Hemoglobin (Hb) are the indicators of erythrocyte normal level and general well beings of animals. In the present study, serum total proteins remained within normal range and did not differ significantly ($p > 0.05$) between the groups. This indicates that experimental feeds had no deleterious effect on serum proteins. Similarly, the values of glucose, albumin, globulin and A : G ratio were comparable and non-significant difference between the groups at the end of experiment which is generally as indicators of some pathological changes of tissue and organ were not altered by yeast culture supplementation are considered. Normal range of blood parameters of goats fed a diet supplemented with dried yeast were indicative of proper blood supply and immunity enhancement. Normal value in blood biochemical indices suggested that the administered yeast supplement had a stimulating effect on energy metabolism and a protective effect on renal function and that it contributed to preventing metabolic acidosis. It also an indicator of good health and no abnormal pathological condition or any abnormality in the animals by feeding of *Saccharomyces cerevisiae*.

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