Original Research

Effect of Dietary Incorporation of *Saccharomyces cerevisiae* (CNCMI-1077) on Feed Intake, Nutrient Utilization and Blood Biochemical Profile in Indigenous Goat Kids

Rahul Singh Panwar, Ashok Kumar Patil*, Ravindra Kumar Jain, R. P. S. Baghel, Mukesh Kumar Mehta and Anchal Keshri

Department of Animal Nutrition, College of Veterinary Sciences & Animal Husbandry, Mhow-453446, Madhya Pradesh, INDIA

***Corresponding author:** ashokdrpatil@gmail.com

Rec. Date:	Oct 18, 2019 09:48
Accept Date:	Nov 15, 2019 17:32
DOI	10.5455/ijlr.20191018094800

Abstract

Twelve indigenous goat kids were selected and randomly divided into two group (n=6), to investigate the effect of dietary incorporation of Saccharomyces cerevisiae (CNCMI-1077) on nutrient intake, nutrient utilization, and blood hemato-biochemical profile of kids. Basal diet consisting with gram straw, green Peepal leaves (Ficus religiosa) and concentrate mixture were fed to both the groups as per requirement given by ICAR, (2013). In addition to basal diet, the animals of treatment group (T_1) were fed Saccharomyces cerevisiae (CNCMI-1077) @ 0.5 g/h/d (10 billion Colony forming unit) whereas, the control group was remains unsupplemented. The results indicated significantly higher intake of DM, OM, CP, EE, ADF, NDF and CF in supplemented group while digestibility of all nutrients was similar between both the groups. The haemato-biochemical parameters like Hb, PCV, RBC, WBC, platelet count, glucose, total protein, albumin, globulin, A:G were statistically (P>0.05) comparable between both the groups. From the results it can be concluded deduced that the dietary supplementation of Saccharomyces cerevisiae (CNCMI-1077) have not any appreciable effect on digestibility of nutrients and haemato-biochemical profile of kids.

Key words: Kids, Haemato-Biochemical, Nutrient Intake, Nutrient Utilization, *Saccharomyces cerevisiae*

How to cite: Panwar, R., Patil, A., Jain, R., Baghel, R., Mehta, M., & Keshri, A. (2019). Effect of Dietary Incorporation of Saccharomyces cerevisiae (CNCMI-1077) on Feed Intake, Nutrient Utilization and Blood Biochemical Profile of Indigenous Kids. International Journal of Livestock Research, 9(12), 198-205. doi: 10.5455/ijlr.20191018094800

Introduction

Use of direct fed microbial (DFM) as rumen modifier to improve animal performance is a good alternative source of antibiotics since, use of antibiotics in animal feed is of enormous concern for human health. Many microbial species are recommended as feed additives in ruminant nutrition and among them the yeast

(*Saccharomyces cerevisiae*) has been found to exert a beneficial effect on the enhanced uptake of nutrients in ruminants. Yeast cells contain different vitamins, enzymes and some unidentified cofactors which improve the microbial activity and growth rate of the rumen microflora (Robinson and Erasmus, 2009), boost hemicelluloses degradability (Lascano *et al*., 2009) and have positive effects on the absorption of some minerals. Inclusion of *Saccharomyces cerevisiae* in ruminants' diets has been shown to alter the molar proportion of ruminal volatile fatty acids reduce rumen ammonia concentration, increase the number of ruminal bacteria and protozoa and alter the flow of the nitrogen fraction to the duodenum (Dawson, 1993). Supplementation of live yeast culture to young ruminants had positive effects on performance, which was evidenced by increased DM intake and body weight gain, feed conversion efficiency, changes in hip height and width (Stella *et al*., 2007) while similar or reduced growth rate and feed conversion efficiency were also reported by Tripathi and Karim (2010). Keeping therefore said properties of yeast probiotic in view, the present investigation was planned to investigate the effect of dietary inclusion of *Saccharomyces cerevisiae* on nutrient intake, nutrient utilization and haemato-biochemical profile of kids.

Materials and Methods

Location and Climate

The present study was conducted in Animal Nutrition Department and in animal's sheds of College of Veterinary Science & A.H., Mhow (Madhya Pradesh). Permission for using the animals for the experiment was duly taken from Institutional Animal Ethics committee (IAEC) constituted as per CPCSEA rules laid down by Government of India.

Animals, Diets and Treatment

Twelve growing indigenous goat kids of BW 11.43±0.68 (4-6 months of age) were randomly allotted to two experimental groups (T_0 and T_1) with 6 kids in each. Prior to experimentation, the kids were given 15 days adaptation period. The kids were offered gram straw, green Peepal leaves and concentrate mixture to meet their nutrient requirements as per ICAR, (2013) recommendation for a body weight gain of 50 g/day.

Table 1: Chemical composition of feeds offered to experimental kids (% DM basis)

Particulars	Concentrate mixture	*Peepal* leaves	Gram straw
Organic matter	95.07	88.83	88.31
Crude protein	22.3	7.74	5.17
Ether extract	2.41	2.44	1.45
Neutral detergent fibre	34.44	55.66	61.25
Acid detergent fibre	10.94	46.85	36.2
Crude fibre	7.34	23.78	38.66
Calcium	1.3	1.87	1.04
Phosphorus	0.73	0.4	0.2

DOI 10.5455/ijlr.20191018094800

All the experimental kids were fed on a basal diet comprised of concentrate mixture, green and gram straw. The concentrate mixture consisted of maize (30%), soybean (37%), wheat (10%), shorghum (10%), bajra (10%), mineral mixture (2%) and common salt (1%). In addition to basal diet, the animals of treatment group (T_1) were fed *Saccharomyces cerevisiae* (CNCMI-1077) @ 0.5 g/h/d (10 billion cfu) and the control group was remains unsupplemented. The study was conducted for 120 days. After 90 days of experimental feeding, a digestion trial of 6 days was conducted during this trial samples of feeds, residue and faecal were collected and analysed for proximate principles table 1 (AOAC, 2005) to assess the utilization and digestibility of nutrients. Neutral detergent fibre (NDF) and acid detergent fibre (ADF) were analysed according to the method of Van Soest *et al.* (1991). Blood was collected from all experimental animals at the 0 day and end of the feeding trial to study haemato-biochemical profile of kids. The serum glucose, total protein, albumin and globulin were estimated by using Erba diagnostic kits. With code No. 120200 (glucose), 120231 (total protein), 120223 (albumin).

Statistical Analysis

The data were subjected to statistical analysis (Snedecor and Cochran, 1994) using independent "t" test to find out significance of difference between the groups.

Results and Discussion

Effect of *Saccharomyces cerevisiae* on Nutrient Intake and Digestibility

Results of the present study revealed that there was significant increase in dry matter intake in probiotic supplemented group; however, it did not affect the intake of digested dry matter (DDM) and DM digestibility of the animals between the groups (Table 2). The present findings are in conformity with Saleem *et al.* (2017) who concluded that a positive effect of probiotic supplementation on feed intake during post weaning period may be due to an increasing number and proportion of cellulolytic bacteria in the rumen and improved ruminal pH, which would be reflected by improved feed intake and fibre digestibility. Similarly, Stella *et al.* (2007) also observed that DMI was increased in Saanen goats fed with *S. cerevisiae* (CNCMI-1077) at 0.2 g/head/day for 12 weeks. The increased in DMI was also reported by various authors (Khalid *et al*., 2011), Macedo *et al*. (2006), Whereas, contrary to our results Kawas *et al*. (2007) found that yeast culture had no positive effect on the dry matter intake and live weight gain of finishing lambs. Similarly, Bruno *et al*. (2009) also reported no any significant change in feed intake in Holstein cows fed *S. cerevisiae* culture.

The digestibility of DM, OM, CP, EE, ADF, NDF and CF were similar in both the groups. Similar to our present finding, Tripathi *et al*. (2008) and Tripathi and Karim (2010) also reported no improvement in the digestibility of DM, OM, CP, NDF and ADF in both pre-weaner and weaner lambs supplemented with different yeast probiotics in high concentrate diet. In contrary to our results Shankhpal *et al*. (2016) showed

  DOI 10.5455/ijlr.20191018094800

that the digestibility coefficients of nutrients for DM, OM, CP, EE, CF, NDF and ADF were significantly (P<0.01) higher in yeast supplemented groups. Contrary to our results Hossain *et al*. (2012) also worked on Kankrej calves and reported that supplementation of *S. cerevisiae* as probiotic improved the digestibility of nutrients and rumen fermentation on growing Kankrej calves.

Table 2: Intake (g/d), digested (g/d) and digestibility (%) of various nutrients in experimental groups.

Attributes (g/d)	T_0 (Control)	T_1 (Treatment)	Significance
Dry matter intake			
Gram straw	148.25±2.46	165.03±2.04	0.56
Peepal leaves	83.12±0.31	83.98±0.07*	0.02
Concentrate	295.70±0.91	305.98±0.12**	0.01
Dry matter			
Total intake	527.07±3.14	551.37±0.99*	0.01
Digestibility	55.90±2.64	58.07±2.67	0.86
Organic matter			
Total intake	485.88±2.82	508.03±0.88**	0.01
Digestibility	62.02±1.63	66.20±1.17	0.15
Crude protein			
Total intake	80.05±0.30	83.08±0.05*	0.02
Digestibility	56.96±3.64	64.18±3.27	0.74
Ether extract			
Total intake	12.46±0.06	12.96±0.01**	0.01
Digestibility	74.83±2.01	79.35±1.47	0.66
Acid detergent fibre			
Total intake	124.96±0.96	131.25±0.37*	0.03
Digestibility	44.16±2.25	46.83±3.69	0.63
Neutral detergent fibre			
Total intake	239.70±1.73	251.78±0.61*	0.02
Digestibility	53.35±2.01	56.04±3.76	0.11
Crude fibre			
Total intake	98.79±1.00	104.83±0.39*	0.03
Digestibility	42.03±3.25	43.65±3.21	0.59

**shows significance at 5 % level as compared to control group (P<0.05); **shows significance at 1 % level as compared to control group (P<0.01)*

 DOI 10.5455/ijlr.20191018094800

Table 3: Plane of nutrition of experimental kids during digestion trial

Attributes	T_0 (Control)	T_1 (Treatment)	Significance
Body wt. (kg)	16.36±0.70	16.86±0.62	0.51
Total DMI (g/d)	527±3.14	551±0.99**	0.01
DMI (g/kg $W^{0.75}$)	65.17±1.98	66.60±2.00	0.84
DMI (kg/100 kg BW)	3.25±0.13	3.30±0.13	0.78
Total CP intake (g/d)	80±0.30	83±0.05*	0.02
CPI (g/kg $W^{0.75}$)	9.90±0.31	10.03±0.29	0.75
CPI (kg/100 kg BW)	0.49±0.02	0.50±0.02	0.61
DCPI (g/d)	45.57±2.84	53.33±2.74	0.97
DCPI (g/kg $W^{0.75}$)	5.69±0.53	6.46±0.45	0.46
DCPI(kg/100 kg BW)	0.28±0.03	0.32±0.02	0.45
TDN (g/d)	316.74±6.61	352.50±5.63	0.25
TDN (g/kg $W^{0.75}$)	39.31±2.08	42.59±1.53	0.17
TDNI (g/100 kg BW)	1963.18±125	2107.71±94	0.21
DCP (%)	8.65±0.56	9.67±0.48	0.63
TDN (%)	60.13±1.51	63.94±1.08	0.16

**shows significance at 5 % level as compared to control group (P<0.05); **shows significance at 1 % level as compared to control group (P<0.01)*

Effect of *Saccharomyces cerevisiae* on Blood-Biochemical Profile

Haemoglobin (Hb) and packed cell volume (PCV) are the indicators of erythrocytic normal level and general well beings of animals. The Hb values were 8.62±0.40 to 8.98±0.19 g/dl between the groups at the end of the experiment and the values were comparable. Similarly, the PCV (%), RBC, WBC and platelets counts were also similar between the groups. Similar to our findings Otzule and Ilgaza (2015) reported that the PCV, haemoglobin, RBC and WBC number was comparable (P>0.05) between groups at 4th and 8th week of feeding probiotic and symbiotic, while contrary to our results there was significant increased in all haematological parameters (P<0.05) at the age of 12 weeks in treatment groups (Otzule and Ilgaza., 2015). Conversely to our results Dar *et al*. (2017) observed that the supplementation of probiotic, prebiotic and synbiotic is advantageous in improving leucocyte count, haemoglobin content and packed cell volume in crossbred calves. The serum total protein concentration in healthy animals normally varies between 6.0 to 7.5 g/dl concentration of serum proteins depends on a variety of factors including extent, duration and is altered during liver and kidney diseases and extremely low values indicate inanition.

In the present study, serum total proteins remained within normal range and did not differ significantly (P>0.05) between the groups (Table 4). 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 between the groups at the end of experiment.

 DOI 10.5455/ijlr.20191018094800

Table 4: Haematobiochemical parameters of experimental groups.

Attributes	T_0	T_1	Significance
Haemoglobin (g/dl)	8.62±0.40	8.98±0.19	0.41
PCV (%)	29.27±0.26	29.57±0.31	0.54
Total Protein (g/dl)	6.95±0.14	7.10±0.14	0.84
Glucose (mg/dl)	45.67±1.76	49.12±1.15	0.37
Albumin (g/dl)	3.23±0.09	3.63±0.07	0.56
Globulin (g/dl)	3.70±0.10	4.02±0.09	0.5
RBC (million mm^3)	13.45±0.43	14.46±0.89	0.08
WBC (10^3 cu/mm)	8.85±0.40	9.10±0.62	0.14
Platelet (10^9/L)	273±9.77	275±6.33	0.18
A:G (g/dl)	0.88±0.04	0.91±0.03	0.43

In agreement to the present study various authors (Ding *et al*., 2008) observed that there was no significant change in blood glucose level in probiotic supplement groups. Contrary to this Sayed (2003) has reported a significant increase in glucose concentration in kids and lactating ewe after probiotic supplementation. Similar findings have been observed in lambs (Hussein, 2014). An increase in serum glucose levels in supplemented animals may be attributed to gluconeogenesis, as after probiotic supplementation there is improvement in gluconeogenesis due to increased propionate production, which is the main precursor of glucose with a decisive influence on the glucose blood concentration in small ruminants. Similar to our results Saha *et al*. (2018) also found no change in serum total protein concentration in probiotic fed groups. In agreement with our results to our results El-Katcha *et al*. (2016) observed that there were no any changes in serum concentration of total protein and globulin in probiotic supplement groups. Conversely to our study, Hussein (2018) observed that there was significantly increased ($P<0.05$) in the values of plasma total protein and glucose, in probiotic supplemented with lambs with comparisons to control group. The differences between some previous studies and the results in this study might be due to the feeding strategy, environmental conditions, diet composition, type of forage, type and dose of yeast and type of yeast feeding.

Conclusion

From the results it can be concluded that the dietary supplementation of *S. cerevisiae* (CNCMI-1077) did not show any appreciable effect on digestibility of nutrients and haemato-biochemical profile of kids.

Acknowledgement

The authors express thankfulness to Lallem and Animal Nutrition for providing *Saccharomyces cerevisiae* (CNCMI-1077) and the Dean, College of Veterinary Sciences & Animal Husbandry, Mhow for providing necessary facilities to carry out the experiment.

 DOI 10.5455/ijlr.20191018094800

Funding

This work was supported by the College of Veterinary Sciences & Animal Husbandry, Mhow.

References

1. AOAC, (2005). Official Methods of Analysis. 18th revised edition. Association of Official Analytical Chemists, Gaithersburg, MD, USA.
2. Bruno, R.G.S., Rutigliano, H.M., Cerri, R.L., Robinson, P.H. and Santos, J.E.P. (2009). Effect of feeding *Saccharomyces cerevisiae* on performance of dairy cows during summer heat stress. *Animal Feed Science and Technology*, 150, 175-186.
3. Dar, A.H., Singh, S. K., Jyoti Palod, Kurat-ul-Ain, Kumar, N., Khadda, B.S. and Farooq, F. (2017). Effect of Probiotic, Prebiotic and Synbiotic on Hematological Parameters of Crossbred Calves. *International Journal of Livestock Research*, Vol 7 (4), 127-136.
4. Dawson, K.A. (1993). Biotechnology in the feed industry. Proceedings of Alltech's 9th Annual Symposium, T.P. Lyons Ed Alltech's Technical Publications, pp 269.
5. Ding, J., Zhou, Z.M., Ren, L.P. and Meng, Q.X. (2008). Effect of monensin and live yeast supplementation on growth performance, nutrient digestibility, carcass characteristics and ruminal fermentation parameters in lambs fed steam-flaked corn-based diets. *Asian-Australasian Journal of Animal Sciences*, 21, 547-554.
6. El-Katcha, M.I., Soltan, M.A. and Essi, M.S. (2016). Effect of Pediococcus spp. Supplementation on Growth Performance, Nutrient Digestibility and Some Blood Serum Biochemical Changes of Fattening Lambs. *Alexandria Journal of Veterinary Sciences*, 49(1), 44-54.
7. Hossain, S.A., Parnerkar, S., Haque, N., Gupta, R.S., Kumar, D. and Tyagi, A.K. (2012). Influence of dietary supplementation of live yeast (*Saccharomyces cerevisiae*) on nutrient utilization, ruminal and biochemical profiles of Kankrej calves. *International Journal of Applied Animal Sciences*, 1(1), 30-38.
8. Hussein, A.F. (2014). Effect of biological additives on growth indices and physiological responses of weaned Najdi ram lambs. *Journal of Experimental Biology and Agricultural Science*, 2(6), 597-607.
9. Hussein, A.F. (2018). Effect of Probiotics on Growth, Some Plasma Biochemical Parameters and Immunoglobulins of Growing Najdi Lambs. *World's Veterinary Journal*, 8(4), 80-89.
10. ICAR (2013). Nutrient requirements of Animals- Cattle and Buffalo. New Delhi.
11. Kawas, J.R., Garcia-Castillo, R., Fimbres-Durazo, H., Garza-Cazares, F., Hernandez-Vidal, J.F.G. and Lu, C.D. (2007). Effects of sodium bicarbonate and yeast on nutrient intake, digestibility and ruminal fermentation of lightweight lambs fed finishing diets. *Small Ruminant Research*, 67, 149-156.
12. Khalid, M.F., Shahjad, M.A., Sarwar, M., Rehman, A.U., Sharif, M. and Mukhtar, N. (2011). Probiotics and lamb performance: A review. *African Journal of Agricultural Research*, 6(23), 5198-5203.
13. Lascano, G. J., Zanton,G. I., Suarez-Mena, M. F. and Heinrichs, A. J. (2009). Effect of limit feeding high- and low-concentrate diets with Saccharomyces cerevisiae on digestibility and on dairy heifer growth and first-lactation performance. *Journal of Dairy Science*, 92(10), 5100-10.
14. Macedo, R., Arredondo, V. and Beauregard, J. (2006). Influence of yeast culture on productive performance of intensively fattened Pelibuey lambs in Colima, México. *Avances en Investigación Agropecuaria*, 10, 59-67.
15. Otzule, L. and Ilgaza, A. (2015). Probiotic and prebiotic influence on hematological values of goat kids. *Research for Rural Development*, 1:174-178.
16. Robinson, P.H., and Erasmus L. J. (2009). Effects of analyzable diet components on responses of lactating dairy cows to *Saccharomyces cerevisiae*-based yeast products: A systematic review of the literature. *Animal Feed Science Technology*, 149(3), 185-198.

 DOI 10.5455/ijlr.20191018094800

17. Saha, S., Singha, S., Ahmed, S.S.U., Toledo-Alvarado, H. and Khan, M.M.H. (2018). Effects of yeast (*Saccharomyces cerevisiae* type boulardii CNCM I-1079) supplementation on growth performance and blood metabolites in Black Bengal goat kids. *Veterinarski Arhiv*, 88(5), 661-672.
18. Saleem, A.M., Zanouny, A.I. and Singer, A.M. (2017). Growth performance, nutrients digestibility, and blood metabolites of lambs fed diets supplemented with probiotics during pre and post weaning period. *Asian-Australasian Journal of Animal Sciences*, 30(4), 523-530.
19. Sayed, A.S. (2003). Studies on the influences of pronifer as a probiotic on the clinical, hematological and biochemical status of goat kids. *Assiut Veterinary Medical Journal*, 99, 131-143.
20. Shankhpal, S., Parnerkar, S. and Bhanderi, B.M. (2016). The effect of feeding bypass fat and yeast (*Saccharomyces cerevisiae*) supplemented total mixed ration on feed intake, digestibility, growth performance and feed conversion efficiency in weaner surti kids. *Livestock Research International*, 4(1), 11-17.
21. Snedecor, C. W. and Cochran, W. G. (1994). Statistical method. Iowa state university press. Ames, Iowa.
22. Stella, A.V., Paratte, R., Valnegri, L., Cigalino, G., Soncini, G., Chevaux, E., Dell'Otro, V. and Savoini, G. (2007). Effect of administration of live *Saccharomyces cerevisiae* on milk production, milk composition, blood metabolites and faecal flora in early lactating dairy goats. *Small Ruminant Research*, 67, 7-13.
23. Subhata M.A.M., Sheikh, G. G., Danish, M. and Bhat, M. A. (2019). Effect of Yeast (Sacchromyces cerevisae) and Herb (Urtica dioica) Supplementation on In-vitro Digestibility and Fermentation Attributes of Paddy Straw. *International Journal of Livestock Research*, 9 (3), 305-311.
24. Tripathi, M.K. and Karim, S.A. (2010). Effect of individual and mixed live yeast culture feeding on growth performance, nutrient utilization and microbial crude protein synthesis in lambs. *Animal Feed Science and Technology*, 155(2), 163-171.
25. Tripathi, M.K., Karim, S.A., Chaturvedi, O.H. and Verma, D.L. (2008). Effect of different liquid cultures of live yeast strains on performance, rumen fermentation and microbial protein synthesis in lambs. *Journal of Animal Physiology and Animal Nutrition*, 92, 631-639.
26. Van Soest, P.V., Robertson, J.B. and Lewis, B.A., (1991). Methods for dietary fiber, neutral detergent fiber, and nonstarch polysaccharides in relation to animal nutrition. *Journal of Dairy Science*, 74(10), pp.3583-3597.

  DOI 10.5455/ijlr.20191018094800