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Research Article

IMPACT OF YEA SACC[1026] SUPPLEMENTATION TO EXCLUSIVE WHEAT STRAW FEEDING ON RUMEN MICROFLORA IN BUFFALO CALVES

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ABSTRACT

The effect of Yea Sacc[1026] supplementation on rumen microflora in healthy rumen fistulated buffalo calves (n=15) was investigated. These calves were divided into three groups viz. group I, II and III with five animals in each group and were kept on conventional diet (wheat straw and green fodder), wheat straw alone and wheat straw supplemented with Yea Sacc[1026], respectively. Rumen liquor samples were collected at different time intervals for three consecutive days after 21 days of microbial adaptation. The results revealed a significant increase in microbial population with Yea Sacc[1026] supplementation. A significantly higher percent holotrich population was also found in yeast supplemented group when compared with group fed wheat straw alone.

Key words: Yea Sacc[1026], buffalo calves, microbial population, holotrichs

Non-availability of green fodder around the year is the major cause of dependence of farmers to utilize the available roughages. Nutritive value of roughages is very poor which in turn causes drastic changes in microflora (Sharma *et al.,* 2009) and have direct impact on animal performance. This study was designed to feed low cost and high quality yeast supplement which is rich source of vitamins, enzymes and other important nutrients making them attractive digestive enhancers and can improve the production performance in ruminants (Mousa *et al.,* 2012). Yea Sacc[1026], a naturally produced live yeast culture of *Saccharomyces cerevisiae*, was used in the present investigation.

MATERIALS AND METHODS

The study was conducted in fifteen rumen fistulated male buffalo calves of age between 6-12 months. These calves were divided into three groups (group I, II and III), each comprising five animals. The animals of group I were kept on conventional diet comprising of wheat straw and green fodder while, the animals of group II and III were fed wheat straw alone and wheat straw supplemented with Yea Sacc[1026] @ one bolus consisting of 25 billion live yeast cells/animal/day, respectively for 21 days to facilitate rumen microbial adaptation. The animals of all the groups were fed twice daily and provided fresh and clean drinking water *ad libitum* immediately after feeding. Rumen liquor samples were collected from each animal in the morning before feeding (0 h) and subsequently at 1, 2, 3, 4, 5, and 6 h post prandial i.e., after feeding wheat straw supplemented with Yea sacc bolus for three consecutive days i.e., 22nd, 23rd and 24th day. Strained rumen liquor samples were preserved in 10% formalin solution and stored at -20°C until analyzed. Total bacterial count, protozoal count and differential counting of holotrichs and entodiniomorphs was carried out on the basis of morphological features (Singh, 2014). The data were subjected to CRD ANOVA using 'SPSS 16.0' software at 5% level of significance. The permission from Institutional Animal Ethics Committee was obtained prior to the start of the present investigation.

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RESULTS AND DISCUSSION

Initially there was a drop in bacterial and protozoal count from 0 h to 1 h post feeding followed by progressive increase which attained peak at 4 h, thereafter decreased at 6 h post feeding in all the groups (Table 1). Initial drop in microbial population could be attributed to dilution factor due to feed, water and saliva. It may also be due to lodging of freely floating microbes to the new feed particles entering into the rumen (Sharma *et al*., 2009). Overall mean value of total bacterial and protozoal count was significantly higher ($P<0.05$) in group III as compared to groups I and II. Increased bacterial number in the rumen could be attributed to the capacity of yeast to remove oxygen from the rumen. Yeast may scavenge

Table 1: Effect of Yea Sacc[1026] supplementation on rumen micro-organisms at different time intervals in buffalo calves

Group	Sampling time (h)							Overall
	0	1	2	3	4	5	6	mean (±SE)
				Total bacterial count ($\times10^9$/ml)				
I	6.54±0.16^{abB*}	6.36±0.18^{aB}	6.92±0.10^{abcB}	7.33±0.09^{cdB}	7.59±0.12^{dB}	7.19±0.18^{cdB}	7.09±0.14^{bcdB}	7.00±0.07^{B}
II	4.79±0.03^{bA}	4.31±0.09^{aA}	5.20±0.10^{cA}	5.95±0.08^{dA}	6.43±0.05^{eA}	6.16±0.07^{deA}	5.94±0.07^{dA}	5.54±0.07^{A}
III	8.19±0.04^{aC}	8.05±0.11^{aC}	9.59±0.11^{bC}	10.09±0.13^{bcC}	11.03±0.10^{dC}	10.47±0.09^{cC}	9.77±0.05^{bC}	9.60±0.11^{C}
				Total protozoal count ($\times10^6$/ml)				
I	2.29±0.08^{aB}	2.11±0.07^{aB}	2.82±0.12^{bB}	3.27±0.11^{bcB}	3.61±0.13^{cB}	3.25±0.08^{bcB}	3.02±0.06^{bB}	2.91±0.06^{B}
II	1.54±0.04^{bA}	1.21±0.06^{aA}	1.61±0.03^{bcA}	1.82±0.06^{cdA}	1.98±0.09^{dA}	1.74±0.03^{bcA}	1.63±0.03^{bcA}	1.64±0.03^{A}
III	3.35±0.02^{bC}	3.15±0.01^{aC}	3.49±0.02^{cC}	3.87±0.02^{eC}	4.46±0.02^{gC}	4.20±0.02^{efC}	3.77±0.02^{dC}	3.76±0.04^{C}
				Percent holotrichs				
I	9.81±0.26^{aB}	28.71±0.25^{fC}	26.90±0.26^{eC}	24.48±0.17^{dC}	21.33±0.22^{bB}	22.64±0.23^{cB}	25.06±0.24^{dC}	22.70±0.57^{B}
II	2.40±0.06^{aA}	3.43±0.09^{bA}	6.32±0.07^{fA}	4.90±0.07^{dA}	4.27±0.04^{cA}	5.42±0.09^{eA}	6.40±0.09^{fA}	4.74±0.14^{A}
III	10.19±0.05^{aB}	25.05±0.07^{fB}	24.23±0.09^{eB}	23.40±0.08^{dB}	21.42±0.06^{bB}	22.29±0.09^{cB}	23.16±0.09^{dB}	21.39±0.46^{B}
				Percent entodiniomorphs				
I	90.26±0.27^{fA}	76.28±0.22^{cdA}	73.09±0.26^{aA}	75.52±0.17^{bcA}	78.67±0.22^{eA}	77.36±0.23^{dA}	74.94±0.24^{bA}	78.02±0.61^{A}
II	97.60±0.06^{fB}	96.57±0.09^{eB}	93.67±0.07^{aC}	95.10±0.07^{cB}	95.73±0.04^{dB}	94.58±0.09^{bB}	93.60±0.09^{aC}	95.26±0.14^{B}
III	89.81±0.05^{gA}	74.95±0.07^{aA}	75.77±0.09^{bB}	76.60±0.08^{cA}	78.58±0.06^{fA}	77.71±0.09^{eA}	76.84±0.09^{dB}	78.61±0.46^{A}

*Each value is mean of 15 observations representing triplicate samples from five experimental animals; Superscripts (in small letters) indicate significant difference (P<0.05) in a row within a group; Superscripts (in capital letters) indicate significant difference (P<0.05) in a column between groups. Group I=Ration containing wheat straw and green fodder; Group II=Ration containing wheat straw alone; Group III=Ration containing wheat straw supplemented with Yea Sacc[1026]

available oxygen on the surfaces of freshly ingested feeds which creates better conditions for the growth of strict anaerobic cellulolytic bacteria thereby stimulating their attachment to forage particles and increasing the initial rate of cellulolysis (Chaucheyras-Durand *et al.*, 2008). Another reason could be that *S. cerevisiae* might have provided growth factors, pro-vitamins and micronutrients that stimulated the growth of bacteria in the rumen (Chaucheyras-Durand *et al.*, 1995).

Significant (P<0.05) increase in the total protozoal count in group III might be due to anaerobic conditions created by oxygen-scavenging activity of the yeast which favoured the growth and multiplication of protozoa of rumen (Chaucheyras-Durand and Fonty, 2002). A significant (P<0.05) increase in microbial counts with conventional feeding might be due to the presence of green fodder, which being a good source of soluble carbohydrates and crude proteins might promote the growth of micro-organisms. However, poor counts of rumen microbes during exclusive feeding of wheat straw may be attributed to sub-maintenance diet and poor source of substrates, especially proteins needed for the synthesis of microbial proteins (Sharma *et al.*, 2009).

Percent holotrichs showed a progressive rising trend upto 1 h followed by a decline in population upto 4 h post feeding and then again increase upto 6 h post feeding in groups I and III. However, holotrichs population showed an increasing trend upto 2 h followed by decline upto 4 h and again increase in population upto 6 h post-prandial in group II (Table 1). Post feeding variations in percent holotrichs might be due to sequesterization phenomenon by which holotrichs sequester onto the wall of reticulum and again rapidly migrate to rumen in response to the pH changes in the rumen (Abe *et al.*, 1981). Mean value of percent holotrichs in groups I and III was significantly higher (P<0.05) than group II. This might be due to the fact that conventional diet given to group I is a readily available source of soluble carbohydrates which further increases the holotrich population (Sharma *et al.*, 2009). Yeast supplementation (group III) increased holotrich population probably due to lowering down of lactic acid production in rumen (Denev *et al.*, 2007) which otherwise would have been responsible for sequesterization of holotrichs due to drastic decrease in ruminal pH.

A greater percentage of entodiniomorphs was observed before feeding of all the diets i.e. at 0 h. The population decreased upto 2 h post feeding in groups I and II, while upto 1 h in group III. Further, it followed a rising trend upto 4 h post feeding in all the groups and again showed a declining trend upto 6 h post-prandial. Percent entodiniomorphs in group III was significantly lower (P<0.05) than group II which might be due to the fact that there was an increase in holotrichs population

which relatively decreased the entodiniomorphs population. In a previous study, we observed that the body weight of the animals fed Yea Sacc supplemented ration increased significantly in comparison to animals fed wheat straw alone. In wheat straw alone fed animals, the body weight fell significantly alongwith deterioration of body condition. The body weight in Yea Sacc supplemented animals was comparable to that of animals fed wheat straw alongwith green fodder (Singh, 2014). We also observed that supplementation of Yea Sacc caused a significant decrease in ruminal pH, sedimentation activity test and methylene blue reduction time and a significant increase in the levels of total volatile fatty acids (acetic, propionic and butyric acids), NH_3-N and total nitrogen in comparison to conventional diet and exclusive wheat straw feeding (Singh, 2014).

The present study indicated that Yea Sacc^{1026} supplementation is beneficial to buffalo calves and it's supplementation may be an economical and effective management technique to tide over the lean period when ample green fodder is not available for feeding. It can be concluded from this study that low cost yeast supplementation alongwith poor quality roughages increases the microbial population which in turn improves the nutrient utilization and subsequently the growth of buffalo calves during green fodder scarcity period.

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