Original Article

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EFFECT OF YEAST CULTURE (*Saccharomyces cerevisiae*) ON RUMINAL MICROBIAL POPULATION IN BUFFALO BULLS

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ABSTRACT

This experiment was carried out to study the effect of yeast culture in the diet on rumen microbial population in buffalo bulls. In a cross over design, six graded Murrah buffalo bulls (254.4±7.98 kg) were randomly divided into two groups of three animals each. The animals in both the groups were offered 1.5 kg concentrate mixture and had access to Hybrid Napier fodder *ad libitum*. In the treatment group, the concentrate mixture was supplemented with yeast culture (*Saccharomyces cerevisiae* CNCM I-1077 strain) at the rate of 0.5 g/animal/day. The results indicated that supplementation of the diet with yeast culture increased significantly the mean protozoal count ($P<0.05$) and the total bacterial count ($P<0.01$) in SRL of graded Murrah buffalo bulls as compared with the control group.

Keywords: yeast culture, protozoal count, bacterial count, buffalo bulls

INTRODUCTION

For many years, ruminant nutritionists and microbiologists have been interested in manipulating the microbial ecosystem of the rumen to improve production efficiency of domestic ruminants. Yeast culture has displayed positive impact on the growth and viability of rumen microflora and the fermenting process in the rumen. But, the results have been inconsistent due to confounding effects of the ration composition, and variations in the strain of the yeast culture and their administration protocol. Addition of *Saccharomyces cerevisiae* live yeast cultures to ruminant diets has improved fibre digestibility and stimulated cellulolytic bacteria (Dawson *et al.,* 1990), increased protozoal count (Singh *et al*., 2008) while in other studies no changes in ruminal protozoa (Corona *et al*., 1999) were observed by the addition of yeast culture to the diet. Therefore, the present experiment was carried out to study the effect of yeast culture (*Saccharomyces cerevisiae* CNCM I-1077 strain) on the rumen microbial population in buffalo bulls.

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MATERIALS AND METHODS

In a crossover design, six graded Murrah buffalo bulls (254.4±7.98 kg), each fitted with a permanant rumen cannula, were randomly divided into two groups (Control and Treatment) of three animals each. Animals in both the groups were offered 1.5 kg concentrate mixture and had access to Hybrid Napier (CO-1 variety) fodder *ad libitum* to meet the nutrient requirements (ICAR, 1998). In the treatment group, the concentrate mixture was supplemented with yeast culture (Levucell SC 20; *Saccharomyces cerevisiae* CNCM I-1077) at the rate of 0.5 g/animal/day. The experiment lasted for 60 days and the crossover was made after 30 days of feeding. Rumen liquor was collected from the bulls at 0, 2, 4 and 6 h post feeding and strained through four layers of muslin cloth and was referred to as strained rumen liquor (SRL). The protozoal count in SRL was determined as per Kamra *et al*. (1991), while the total bacterial count was determined as per Gall *et al*. (1949).

Statistical analysis of the data was carried out as per the procedures suggested by Snedecor and Cochran (1976).

RESULTS AND DISCUSSION

The DMI expressed as kg / 100 kg b.wt was 3.29 kg and 3.44 kg in control and treatment groups, respectively. Supplementation of the diet with yeast culture increased the DMI (kg / 100 kg b. wt.) but the difference is not significant (P>0.05).

Protozoal Count: The mean total protozoal count (x10^4 / ml of SRL) in the yeast-culture supplemented (YS) group (21.50±1.48) was higher (P<0.05) than in the control (15.42±1.36). Many studies have been conducted to study the effect of yeast cultures on protozoa populations. In some cases (Newbold *et al.,* 1995; Yoon and Stern, 1996) the yeast culture did not modify total protozoa count while in other studies (Plata *et al*., 1994; Kumar *et al.,* 1994; Singh *et al*., 2008), the total protozoal count increased.

Time of sampling had significant (P<0.01)

Table 1. Effect of dietary supplementation of yeast culture on rumen microbial population in buffalo bulls.

Parameter/ Treatment	Time of rumen liquor sampling (h)				Treatment average
	0	2	4	6	
Protozoal Count (x10^4 / ml of SRL)*					
Control	10.67±1.20	17.00±1.46	22.33±1.71	11.67±1.14	15.42±1.36^a
YS	16.33±1.54	23.33±1.89	29.33±1.14	17.00±1.46	21.50±1.48^b
Overall*	13.50±1.26^a	20.17±1.49^b	25.83±1.44^c	14.34±1.20^a	
Total Bacterial Count (x10^9 / ml of SRL)**					
Control	5.77±0.28	7.96±0.24	11.23±0.31	9.72±0.28	8.67±0.27^a
YS	9.13±0.29	14.07±0.42	18.33±0.49	16.29±0.62	14.46±0.44^b
Overall*	7.45±0.54^a	11.02±0.95^b	14.78±1.11^c	13.01±1.04^{bc}	

$^{a, b, c}$Means with different superscripts in a row and column differ significantly.

*(P<0.05) **(P<0.01)

effect on the total protozoal count. The total protozoal count was the highest (25.83±1.44) at 4 h post-feeding. It increased (P<0.01) from 0 h to 4 h post-feeding, and then declined (Table 1). Feed offer was associated with an abrupt increase in the total protozoal population within the first 4 h of post-feeding, which could be due to migration of protozoa from the reticulo-ruminal wall where they sequester from the rumen medium in response to chemical stimuli originating from the diet. The migration of protozoa into rumen liquor was due to chemotactic movement towards the feed entering the rumen. After the feed was utilized, the protozoa gradually migrated back to the reticulo-ruminal wall after 6 h post-feeding resulting in the observed drop in their numbers in the rumen liquor in both groups. Further, Iqbal *et al.* (1993) reported that irrespective of diets, the protozoal number increased after feeding and reached a peak at 4 h post feeding, thereafter, the concentration decreased gradually. This increase in protozoal count after feeding may be attributed to availability of substrate for protozoal growth. These results corroborated with those of Singh *et al*. (2008) in buffalo calves.

Bacterial Count: The mean total bacterial count ($x10^9$/ml of SRL) in the YS group (14.46±0.44) was higher (P<0.01) than the control (8.67±0.27). The increase in the total bacterial count in the YS group may be attributed to the positive effect of the yeast culture. These results were in agreement with the findings of Rita Sharma *et al.* (1988), Dolezal *et al.* (2005) and Kowalik *et al.* (2008).

Time of sampling had a significant (P<0.01) effect on the total bacterial count. The total bacterial count concentration was the highest (14.78±1.11) at 4 h post-feeding. It increased (P<0.01) from 0 h to 4 h post-feeding, and then declined (Table 1). These results corroborated with those of Singh *et al*. (2008) in buffalo calves. The probable reason for increased rumen microbial numbers after yeast culture supplementation could be assigned to the capacity of yeast to remove oxygen from the rumen.

Thus, it can be concluded that supplementation of yeast culture (Levucell SC 20) 0.5 g/animal/day in the diet of graded Murrah buffalo bulls increased the microbial population in the rumen.

REFERENCES

Corona, L., G.D. Mendoza, F.A. Castrejon, M.M. Crosby and M.A. Cobos. 1999. Evaluation of two yeast cultures (*Saccharomyces cerevisiae*) on ruminal fermentation and digestion in sheep fed a corn stover diet. *Small Ruminant Res*., **31**(3): 209-214.

Dawson, K.A., K.E. Newman and J.A. Boling. 1990. Effects of microbial supplements containing yeast and lactobacilli on roughage fed ruminal microbial activities. *J. Anim. Sci.,* **68**: 3392-3398.

Dolezal, P., J. Dolezal and J. Trinacty. 2005. The effect of *Saccharomyces cerevisiae* on ruminal fermentation in dairy cows. *Czech J. Anim. Sci.,* **50**(11): 503-510.

Gall, L.S., W. Burroughs, P. Gerlaugh and B.H. Edgington. 1949. Special methods for rumen bacterial studies in the field. *J. Anim. Sci.,* **8**: 433-440.

ICAR. 1998. *Nutrient Requirements of Livestock and Poultry.* Indian Council of Agricultural Research, New Delhi, India.

Iqbal, S., R.V. Singh and M.S. Setia. 1993. Influence of diets on the population of rumen bacteria

and protozoa in buffalo calves (*Bubalus bubalis*). *Buffalo J.*, **1**: 87-91.

Kamra, D.N., R.K. Sawal., N.N. Pathak., N. Kewalramani and N. Agarwal. 1991. Diurnal variation in ciliate protozoa in the rumen of black buck (*Antilope cervicapra*) fed green forage. *Lett. Appl. Microbiol.*, **13**: 165-167.

Kowalik, B., T. Michalowski., J.J. Pajat., M. Taciak and J. Rawa. 2008. The effect of supplementing cows with live yeast, *Saccharomyces cerevisiae*, on ciliate and ruminal fermentation. *J. Anim. Feed Sci.,* **17**(2): 157-165.

Kumar, U., V.K. Sarean and S. Singh. 1994. Effect of *S. cerevisiae* yeast culture supplement on ruminal metabolism in buffalo calves given a high concentrate diet. *Anim. Prod.,* **59**: 209-215.

Newbold, C.J., R.J. Wallace, X.B. Chen and F.M. Mcintosh. 1995. Different strains of *Saccharomyces cerevisiae* differ in their effects on ruminal bacterial numbers *in vitro* and in sheep. *J. Anim. Sci.,* **73**: 1811-1818.

Plata, P.F., M.G.D. Mendoza, J.R. Barcena-Gama and M.S. Gonzalez. 1994. Effect of a yeast culture (*Saccharomyces cerevisiae*) on neutral detergent fiber digestion in steer fed oat straw based diets. *Anim. Feed Sci. Tech.,* **49**: 203-210.

Rita, Sharma, O.P. Nangia and M. Gupta. 1998. Effect of yeast culture (*Saccharomyces cerevisiae*) plus growth medium supplementation on rumen fermentation in buffalo calves fed high roughage diet. *Indian J. Anim. Sci.,* **13**: 121-126.

Singh, G., S. Kulkarni and R. Singh. 2008. Effect of *Saccharomyces cerevisiae* (Yea-sacc^{1026}) supplementation on rumen profile in buffaloes. *Indian J. Anim. Sci.,* **78**(2): 172-174.

Snedecor, G.W. and W.C. Cochran. 1976. *Statistical Methods*, 7th ed. Oxford and IBH Publishing Company, Kolkata, Imdia.

Yoon, I.K. and M.D. Stern. 1996. Effects of *Saccharomyces cerevisiae* and *Aspergillus oryzae* cultures on ruminal fermentation in dairy cows. *J. Dairy Sci.,* **79**: 411-417.

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Verma, A.K. and N.S.R. Sastri. 1994. Comparison of Buffalo housing practices prevalent in rural Haryana with organized farm, p. 21-23. *In Proceedings of National Symposium on Livestock Production and Management Held at Anand,* Gujarat, India.

Yadav, B.L. and M.C. Yadav. 1995. Adoption level and index of buffalo husbandry practices in the home tract of Murrah. *Indian J. Anim. Prod. Mgmt.,* **11**: 4-13.