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Research Article

EFFECT OF YEAST CULTURES SUPPLEMENTATION ON THE PERFORMANCE OF CROSSBRED COWS: A FIELD TRIAL

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Abstract- A study was undertaken to investigate the effect of supplementing different doses of yeast cultures (*Saccharomyces cerevisiae*) on milk production, milk composition and feed conversion efficiency. The experiment was conducted by using Randomized Block Design (RBD) with three treatments T0 -Without *Saccharomyces cerevisae*, T1 - (*Saccharomyces cerevisae*) @ 0g / day. T2 -*Saccharomyces cerevisae* @ 20g / day. The dietary supplementation of yeast cultures significantly (P<0.05) increased DMI when presented in kg/100 kg body weight and kg/whole milk. The average roughage intake was significantly higher (P<0.05) in T2 group as compared to T0 group. The average milk yield and fat yield were significantly (P<0.05) higher in T2 groups, as compared to T0 and T1 group. However, average fat per cent in milk did not differ significantly from each other. The feed conversion efficiency for dry matter (kg/kg whole milk) was 1.076±0.140, 1.118±0.153 and 1.172±0.175 in T0, T1 and T2 groups, respectively, which significantly (P<0.05) differed from each other. The average daily DCP intake and TDN intake in T0, T1 and T2 groups were similar. The daily feed cost was significantly (P<0.05) higher in T2 groups, as compared to T0 and T1 group. When the economics of milk production on supplementing yeast culture was calculated, it was observed that supplementing yeast cultures to crossbred cows resulted in increase in net daily income of Rs. 14.26 per cow, in T2 groups, as compared to control group (T0).

Keywords- Milk production, Milk fat, Feed conversion efficiency, Yeast culture, Crossbred cows.

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Introduction

The use of yeast cultures to improve production efficiency and the underlying mechanisms for such improvement have attracted increasing attention during recent years [36]. Yeast cells are known to be a rich source of vitamins, enzymes and some unidentified cofactors that are helpful in increasing microbial activity in the rumen [37] hence, yeast culture supplementation has been shown to improve the growth rate [24] and feed conversion efficiency [18]. However, the effects of dietary yeast supplementation on milk yield and milk composition are varied. In some studies, yeast culture supplementation was shown to increase milk production and milk fat percentage [11, 26, 37], while in other studies, neither of these parameters was shown to be significantly altered by yeast supplementation [28]. Furthermore, while several workers [35,37] have reported that dietary yeast culture supplements produce a range of effects in the rumen including increased pH, increased ruminal concentration of volatile fatty acids and acetate: propionate ratio [2,33] decreased methane production and increased total number of microorganisms and cellulolytic bacteria, others have demonstrated no effect of yeast culture supplementation on ruminal pH, ammonia-N and VFA patterns [1,28,7]. The objectives of the following study were to examine the effect of supplementing yeast culture on different doses on milk yield, milk composition and feed conversion efficiency of lactating HF crossbred cows in India.

Materials and Methods

The field trial was undertaken at farmer's dairy farm of Kishanganj, Bihar. Thirty cross bred cows in their early to mid lactation stage (lactation number 2 to 7) and having an average daily two week pretrial milk yield of groups (ten animals in each group) in such a way that the order of lactation and average milk yield of three groups were more or less similar. The present experiment was conducted by using Randomized Block Design (RBD) with three treatments T0-Without *Saccharomyces cerevisae*, T1-(*Saccharomyces cerevisae*)@ 10g / day. T2-*Saccharomyces cerevisae*@ 20g / day.

The animals were fed according to farmer's feeding schedule, Mustrad cake, Himul dana, Maize darra, Dal chuni and Besan (kg) 0.5,2,2,0.5,0.0;0.5, 2,4,0.5,0.25 and 0.5,2,4,0.5,0.5 respectively to cow yielding 5-10; 10-15 and 15-20 kg milk/day. All animals were fed paddy straw adlib. The probiotics used were containing *Saccharomyces cerevisae* supplied by Indian Immunological Private limited. The cows were fed concentrate mixture at time of morning and evening milking. For two weeks preliminary trial period only ration were fed. After two weeks preliminary period probiotics were supplemented with concentrate mixture.

Recording of observations

Milk production was recorded daily after morning and evening milking by farmers. Milk sample for fat analysis were collected fortnightly from morning and evening milking throughout the experimental period. Fat content of milk was determined by milko tester in milk cooperative society. Nutrient intakes as % of requirement were calculated as per [14].

The cost of feeding experimental animals under the three groups was worked out

from daily feed intake and actual purchased price of feeds and fodder. Feed conversion efficiency was calculated as the amount of DM, DCP and TDN required from concentrate mixture and paddy straw to produce one kg of whole milk or 4% FCM. Economic efficiency was expressed as the daily feed cost, feed cost per kg 4% FCM and the ratio between daily feed cost and price of 4% FCM. The data generated during the experiment were subjected to one way analysis of variance as per the methods of [30].

Results and Discussion

Effect of Supplementing Yeast Culture on Dry Matter Intake and Production Efficiency

The average dry matter intake (DMI) of cows in T0, T1 and T2 groups was 11.90±0.37, 12.36±0.37 and 13.79±2.19 kg/head/d and when expressed as kg/100 kg body weight was 2.72±0.11, 2.67±0.12 and 3.01±0.05, respectively. The average DM intake (kg/day), kg/100 kg body weight and kg/kg whole milk is presented in [Table-1]. It was observed in the present study that dietary supplementation of yeast cultures had no significant effect on the average dry matter intake of cows from different groups. But significantly (P<0.05) increased when presented in kg/100 kg body weight and kg/whole milk. The average Roughage intake (RI), concentrate intake and roughage- concentrate ratio of cows in T0, T1 and T2 groups was 7.00±,0.17, 7.50±0.15 and 8.20±0.16;4.90±0.37, 4.86±0.48 and 4.80±0.39; 59:41, 61:39, 64:36, respectively. The average roughage intake was significantly higher (P<0.05) in T2 group as compared to T0 group, which shows the increase in appetite of animals after feeding yeast culture. Increase in DMI due to increase in roughage intake because farmers fed concentrate in limited quantity and roughage ad lib.

Ten grams of *Saccharomyces cerevisiae*/g were top-dressed increased DMI [39]. Similar result reported by [8, 9, 32, 37] who reported that yeast supplementation increased DM intake of experimental cows. Dry mater intake of cows was unaffected by the treatment with yeast culture at 60 g/day, when supplied through feed [29]. DM intake in crossbred cows was not affected by supplementing probiotic feed supplement at 10 g/head/day and at 20 g/head/day, as top dressing over concentrate mixture [25]. In agreement with that, some studies with lactating animals found no response in dry matter intake [4, 26, 35,31,38]. The addition of yeast cultures to the diets of lactating cows increased total concentrations of cellulolytic bacteria in the rumen, but this increase may have not affected total fiber digestion or dry matter intake [12].

Table-1 *Effect of yeast culture supplementation on dry matter intake, milk production and production efficiency*

	Dietary treatments			
Attributes	T0	T1	T2	SEM
Average daily DMI (Kg)	11.90	12.36	13.79	1.97
DMI (Kg/100kg)	2.72 [a]	2.67 [a]	3.01 [b]	0.14
DMI (Kg/whole milk)	1.076 [a]	1.118 [ab]	1.172 [b]	0.036
Average roughage intake (kg/d)	7.00 [a]	7.50 [ab]	8.20 [b]	0.291
Average concentrate intake (kg/d)	4.90	4.86	4.80	0.29
Roughage concentrate Ratio	59:41	61:39	64:36	2.34
Production efficiency (kg DMI /kg FCM)	1.10	1.13	1.18	0.044

[a,b]Values with different superscripts in arrow differ (p<0.05)

Effect of Supplementing Yeast Culture on Milk Yield, 4% FCM Yield and Fat Per cent:

[Table-2] shows the average milk production for the pretrial period and trial period for T0, T1 and T2. It is observed from above table that average milk production of pretrial period (two weeks) was 12.75, 12.82 and 13.13 kg for T0, T1 and T2, respectively.

This means that there were not significant differences between all treatments before starting experiment. However, after starting feeding yeast culture from first fortnight changes in milk production was observed gradually. It is observed that average milk production of T0, T1 and T2 was 13.28, 13.58 and 13.92 kg respectively after treatment period of five fortnights. If these values compared with pretrial period it indicates that, there is increase in milk production by 0.530, 0.770 and 0.790 kg in T0, T1 and T2 group.

This data showing that there is average more increase in milk production by 1.54 and 3.23 kg in T1 and T2 than T0 group in experimental period. After fourth fortnight there was decrease in milk production in control group but probiotic supplemented group maintained their production. After supplementation of 20g multi-strain probiotics milk yield improved gradually from third week [34].

Table-2 *Effect of yeast culture supplementation on milk production.*

	Dietary treatments			
Attributes	T0	T1	T2	SEM
Pre-trial Milk yield (kg/d)	12.75	12.82	13.13	6.62
Trial Milk yield (kg/d)	13.28 [a]	13.58 [a]	13.92 [b]	0.310
Fat%	3.92	3.99	4.08	0.134
Fat Yield (kg)	0.53 [a]	0.53 [a]	0.57 [b]	0.024
4% FCM Yield (kg/d)	12.98	13.29	13.79	0.412
Production efficiency (kg DMI /kg FCM)	1.10	1.13	1.18	0.044

[a,b]Values with different superscripts in arrow differ (p<0.05)

The average milk yield and 4% FCM yield and production efficiency is presented in [Table-2]. The experimental cows under T0, T1 and T2 groups on an average produced (kg/head/d) whole milk 13.28±1.94, 13.58 ±2.08 and 13.92±2.19, 4% FCM (kg/head/d) yield 12.98±1.94, 13.29±2.04 and 13.79±2.19, fat (%) in milk 3.92±0.07, 3.99±0.07 and 4.08±0.06, and fat yield 0.53±0.08, 0.53±0.08 and 0.57±0.09 respectively. The average milk and fat yield was significantly higher (P<0.05) in T2 groups as compared to T0 and T1 group. Milk yield improved significantly over control after supplementation of yeast culture containing *Saccharomyces cerevisiae* at 30 g/day/cow [5]. Inclusion of live yeast increased 3.5% FCM yield and feed efficiency across multiple experiments with varying diets [19]. These improvements without any effect on DM intake (P>0.10) could be a consequence of improved rumen function [3,6,27] or reduced nitrogen waste [20]. Significant increase in milk production associated with yeast supplementation, have previously been reported in dairy cows [25,26,38]. Milk response to feeding yeast culture usually ranges between 1 and 2 kg/d [5,28]. But in present study Milk response to feeding yeast culture is 640g Slightly higher milk fat has been observed by some workers in lactating cows when supplemented yeast culture as feed additive [16,10,37]. Supplementation of live yeast to lactating cows reduced acetate: propionate ratio in rumen liquor, reflective of increase in the concentration of propionic acid in rumen [22]. In the present study, the significant improvement in milk and fat yield that observed by supplementing *Saccharomyces cerevisiae,* at 20 g/animal/day could be because of increase in the propionic acid concentration in the rumen of cows, as propionic acid is a precursor for milk production [21]. Another reason behind improvement in milk and fat yield could be that cows fed with yeast supplement tended to have greater flows of microbial protein and amino acid to the duodenum than the control cows. Improvement in amino acid flow to the duodenum might be responsible for increasing the milk production [15].

Nutrient Intakes of Cows and Return over Feed Cost during Experimental Period

The average daily DCP intake (kg/head/d) of experimental cows is given in [Table-3]. The average daily DCP intake was 0.647±0.080, 0.642±0.024 and 0.653±0.024 kg/head in T0, T1 and T2 groups, respectively. The average daily TDN intake was 7.23±0.29, 7.38±0.27 and 7.61±0.24 kg/head in T0, T1 and T2 groups, respectively. The average daily DCP intake as per cent of requirement was 82.85±5.71, 81.97±6.23 and 82.15±6.71 %, DCPI/Kg FCM 0.058±0.007, 0.057±0.007 and 0.057±0.008, respectively, in T0, T1 and T2 groups and was statistically similar. The average daily TDN intake as per cent of requirement of cows in T0, T1 and T2 groups was 210 ±25.89, 213±27.81 and 218±31.75%, TDN intake /Kg FCM 0.661±0.079, 0.671±0.087 and 0.686±0.100 respectively. The three groups did not differ from each other. The DCP intakes were less and TDN intakes was high which shows field condition where locally available mustard oil cakes not preferred also compounded cattle feed not too much popular and

roughage fed *ad lib*.

The daily feed cost (Rs./head) in T0, T1 and T2 was 123±8.39, 122.70±7.00 and 126.80±7.0 and feed cost (Rs./kg milk yield) was 10.60±1.08, 10.72±1.26 and 11.03±1.42 respectively. The daily feed cost was significantly (P<0.05) higher in T2 groups, as compared to T0 and T1 group. Higher feed cost on account of feeding yeast culture [13, 25]. The data on daily realizable receipt [Table-3] from sale of milk (Rs/head) was 215.60±33.30, 216.10±33.10 and 233.70±37.80 in T0, T1 and T2 groups, respectively and significantly (P<0.05) higher in T2 than T0 and T1 group. This is the reflection of higher milk yield in T2 groups, as compared to T0 and T1 group. The daily ROFC (Rs./head) was 92.60±29.8, 93.4±27.7 and 106.90±31.8 in T0, T1 and T2 groups respectively. The daily ROFC was significantly (P<0.05) higher in T2 groups as compared to T0 and T1 group. When the economics of milk production on supplementing yeast culture at 10 g/animal/day and 20g/animal/day was calculated [Table-3], it was observed that supplementing yeast cultures @ 20g/animal/day to crossbred cows resulted in increase in daily income of 14.30 per day/animal as compared to control group (T0).

Table-3 *Effect of yeast culture supplementation on nutrient intakes and return over feed cost*

	Dietary treatments			
Attributes	**T0**	**T1**	**T2**	**SEM**
Average DCPI (kg/d)	0.647	0.642	0.653	0.006
Average DCPI (% requirement)	82.85	81.97	82.15	1.78
DCPI (kg/kg FCM)	0.058	0.057	0.057	0.002
Average TDNI (kg/d)	7.227	7.380	7.606	0.052
Average TDNI (% requirement)	210.40	213.23	218.28	8.45
TDNI (kg/kg FCM)	0.661	0.671	0.686	0.026
Daily cost of feeding (Rs/head)	123.00	122.70	126.80	1.72
Feed cost (Rs/kg Milk yield)	10.60	10.72	11.03	0.364
Feed cost (Rs/kg FCM yield)	10.86	10.86	11.08	0.423
Daily realizable receipt (Rs/head)	215.6^{a}	216.1^{a}	233.7^{b}	9.75
Daily return over feed cost (Rs/head)	92.6	93.4	106.9	10.20
Net difference in ROFC over control (Rs/head/day)		0.81	14.26	

^{a,b}Values with different superscripts in arrow differ (p<0.05)

Conclusion

From the present study, it could be concluded that supplementation of yeast culture (*Saccharomyces cerevisiae*) at 20g/animal/day in the ration of crossbred cows was found to be advantageous in improving the milk yield, and feed intake significantly, during their early lactation. The return over feed cost was significantly higher in T2 group supplemented with *Saccharomyces cerevisiae* at @20 g/animal/day, as compared to @10 g/animal/day and Control.

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Conflict of Interest: None declared

References

[1] Adams A.L., Harris Jr. B., Van Horn H.H. and Wilcox C.J. (1995) *Journal of Dairy Science*, 78, 573-581.
[2] Alshaikh M.A., Alsiadi M.Y., Zahran S.M., Mogawer H.H. and Aalshowime T.A. (2002) *Asian-Australian Journal of Animal Science*, 15(3), 352-356.
[3] Bach A., Iglesias C. and Devant M. (2007) *Animal Feed Science and Technology*, 136,146-153.
[4] Bagheri M., Ghorbani G.R., Rahmani H.R., Khorvash M., Nili N. and Südekum K.H. (2009) *Asian-Australian Journal of Animal Science,* 22, 812-818.
[5] Bruno R.G.S., Rutigliano H.M., Cerri R.L., Robinson P.H. and Santos J.E.P. (2009) *Animal Feed Science and Technology*, 150, 175-186.
[6] Chaucheyras-Durand F. and Fonty G. (2001) *Reproduction Nutrition Development,* 41, 57-68.
[7] Chaudhary L.C., Sahoo A., Agarwal N., Kamra D.N. and Pathak N.N. (2008) *Indian Journal of Animal Science*, 78, 515-521.
[8] Dawson K.A. and Tricarico J. (2002) *The evolution of yeast cultures-20 years of research. Page No. 26-43, inNavigating from Niche Markets to Mainstream*: Proceedings of All tech's European, Middle Eastern and African Lecture Tour.
[9] Desnoyers M., Giger-Reverdin S., Bertin G., Duvaux-Ponter C. and Sauvant D. (2009) *Journal of Dairy Science*, 92, 1620-1632.
[10] Dutta T.K. and Kundu S.S. (2008) *The Indian Journal of Animal Science*, 78, 531-535.
[11] Erasmus L.J., Botha P.M. and Kistner A. (1992) *Journal of Dairy Science*, 75, 3056-3065.
[12] Harrison G.A., Hemken R.W., Dawson K.A., Harmon R.J. and Barker K.B. (1988) *Journal of Dairy Science*, 71, 2967-2975.
[13] Hossain S.A., Parnerkar S., Haque N., Gupta R.S., Kumar D. and Tyagi A.K. (2012) *International Journal of Applied Animal Science*, 1(1), 30-38.
[14] ICAR (1998) *Nutrient Requirement of Livestock and Poultry. Indian Council of Agricultural Research, New Delhi, India*.
[15] Iwanska S., Strusisnska D. and Zalewski W. (1999) *Acta Veterinaria Hungarica*, 47, 53-63.
[16] Kung Jr L., Kreck E.M., Tung R.S., Hession A.O., Sheperd A.C., Cohen M.A., Swain H.E. and Leedle J.A.Z. (1997)*Journal of Dairy Science*, 80, 2045-2051.
[17] Maamouri O., Selmi H. and M'hamdi N. (2014) *Scientia agricultur aebohemica,* 45(3), 170–174
[18] Mir Z. and Mir P.S. (1994) *Journal of Animal Science*, 72, 537-545.
[19] Moallem U., Lehrer H., Livshitz L., Zachut M. and Yakoby S. (2009) *Journal of Dairy Science*, 92, 343-351.
[20] Moya D., Calsamiglia S., Ferret A. and Fuentes M.C. (2007) *Journal of Dairy Science*, 90 (Suppl. 1), 337 (Abstr.).
[21] Newbold C.J. and Rode L.M. (2006) *International Congress* Series, 1293, 138-147.
[22] Newbold C.J., Wallace R.J., Chen X.B. and McIntosh F.M. (1995) *Journal of Animal Science*, 73, 1811-1818.
[23] Ondarza M.B., Sniffen C.J., Dussert .L, Chevaux E. and Sullivan 'J. (2011) *Feedstuffs*, 83(4), 1-3.
[24] Panda A.K., Singh R. and Pathak N.N. (1995) *Journal of Applied Animal Research*, 7, 195-200
[25] Phondba B.T., Kank V.D., Patil M.B., Gadegaonkar G.M., Jagadale S.D. and Bade R.N. (2009) *Animal Nutrition and Feed Technology*, 9, 245-252.
[26] Piva G., Belladonna S., Fusconi G. and Siebaldi F. (1993) *Journal of Dairy Science*, 76, 2717-2722.
[27] Poppy G.D., Rabiee A.R., Lean I.J., Sanchez W.K., Dorton K.L. and Morley P.S. (2012) *Journal of Dairy Science*, 95, 6027-6041.
[28] Robinson P.H. and Garrett J.E. (1999) *Journal of Animal Science*, 77, 988-999.
[29] Schingoethe D.J., Linke K.N., Kalscheur K.F., Hippen A.R., Rennich D.R. and Yoon I. (2004) .Journal of Dairy Science, 87: 4178-4181.
[30] Snedecor G.W. and Cochran W.G. (1994)*Statistical Methods.*8th ed., Oxford and IBH Publishing Co. Pvt. Ltd., NewDelhi, India.
[31] Soder K.J. and Holden L.A. (1999) *Journal of Dairy Science*, 82, 605-610.
[32] Stella A.V., Paratte R., Valnegri L., Cigalino G., Soncini G., Chevaux E., Dell' Orto V. and Savoini G. (2007) *Small Ruminant Research*, 67, 7-13.
[33] Tricarico J.M., Harrison G.A. and Johnston J.D. (2006) Page No. 72, *in the Proceedings of 22nd Annual Symposium on "Nutritional Biotechnology in the Feed and FoodIndustries" (Supplement I), Lexington, KY, USA*.

[34] Vibhute V. M., Shelke R.R., Chavan S.D., Nage S.P. (2011) Vet. World, 4(12), 557-561.
[35] Williams P.E.V. (1989) Page No. 65-84, *in Proc. Of Alltech's fifth Annual Symposium on "Biotechnology in the Feed Industry" (Edited by T P Lyons) All tech Technical Publications, Nicholasville, USA.*
[36] Williams P.E.V. and Newbold C.J. (1990) *Page No. 211-227, in "Recent Advances in Animal Nutrition", W. Haresing and D.J.A. Cole (Editor), Butterworths, London, U.K.*
[37] Williams P.E.V., Tait C.A.G., Innes GM and New bold CJ (1991) *Journal of Animal Science*, 69, 3016-3026.
[38] Wohlt J.E., Corcione T.T. and Zajac P.K. (1998) *Journal of Dairy Science*, 81, 1345-1352.
[39] Wohlt J.E., Finkelstein A.D. and Ghung C.H. (1991) *Journal of Dairy Science*, 74, 1395-1400.
[40] Zhang Y.L., Cheng Q.F., Cao Y.X., Wang Y.H., Zhang Z.S., Wu Y.Q. and Zhou Y.Y. (2000).*China Dairy Cattle,* 5, 20-22