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Effect of Feed Additives on Nutrient Intake and Feed Efficiency of Lactating Crossbred Cows

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This study was conducted to evaluate the nutrient intake of crossbred cows fed different feed additives based diets using twelve lactating crossbred cows of Holestein Fresian X Sahiwal (HFXS) and Jersy X Sahiwal (JXS) nearly similar stage of lactation. The cows were assigned into treatments having, T_1 = Feed Additive-A based diet, T_2 = Feed Additive-B based diet, T_3 = Feed Additive-C based diet with similar concentrate mixture, using randomized complete block design into three blocks of four animals. The Feed intake and milk production were assessed. The daily intake of DM, CP, TDN and ME for cows fed, the T1 based ration than for the cows fed the T2 and T3 based diets. The daily ME intake was almost similar in T2 and T3 groups than T1 group of animals. However, the daily intake of DM, CP, TDN and ME for crossbred cow on T1 based diet was higher ($P < 0.05$) than for cows on T_2 based diet and T_3 based diet. The DMI (% of body weight) was higher in T_2 T_1 and T_2 based diets, while CPI (% of body weight) was higher in T_2 based diet than T_3 and T_1 based diets. Nutrient intake of Crossbred cows was affected ($P < 0.05$) by the addition of Feed Additive in the diets. The performances of the cows on the Feed Additives in the diets were superior to that of Feed Additive-A based diet.

Introduction

The nutritional needs of dairy animals with respect to energy, protein, minerals and vitamins have long been known, and these have been refined in recent decades. Various requirement determination systems exist in different countries for ruminants and non-ruminants, which were originally designed to assess the nutritional and productive consequences of different feeds for the animal once intake was known. In modern-day farming, the nutritional requirements of farm animals are well understood and all requirements can be met through direct dietary supplementation of the limiting nutrients in concentrated form. Feeding high producing cows continues to challenge dairy farmers and nutritionists.

Feed additives are a group of feed ingredients that can cause a desired animal response in a non-nutrient role such as pH shift, growth, or metabolic modifier (Hutjens, 1991). Feed additives provide a mechanism by which such dietary deficiencies can be addressed which benefits not only the nutrition and thus the growth rate of the animal concerned, but also its health and welfare. Nutritional quality of a feed is influenced not only by nutrient content but also by many other aspects such as, feed presentation, hygiene, content of antinutritional factors, digestibility, palatability and effect on intestinal health to name a few. Feed additives provide a mechanism by which such dietary deficiencies can be addressed which benefits not only the nutrition and thus the growth rate of the animal concerned, but also its health and welfare. In addition, the beneficial effect of probiotics could be produced in two ways. They could operate by: (1) Suppressing harmful bacteria; this could manifest itself in reduced numbers of bacteria or in a decreased concentration of harmful metabolites such as enterotoxin. (2) Stimulation of bacteria which are engaged in beneficial activities such as production of essential nutrients like vitamins or in digestion of food components (Mulder, 1991). In view of the aforesaid, the present research work was planned at the dairy farm, Banaras Hindu University, Varanasi. The plan of work comprised finding out the effect of feed additives and their impact on nutrient intake of lactating crossbred cows maintained at the dairy farm.

Materials and Methods

This investigation was undertaken to study the nutrient intake of crossbred lactating cows on diet containing different feed additives at dairy farm, of Banaras Hindu University, Varanasi. The trial was conducted on 12 crossbred cows Holestein Fresian X Sahiwal (HFXS) and Jersy X Sahiwal (JXS) nearly similar stage of lactation were selected from the herd maintained at the dairy farm. The animals were quite healthy and their calves have been weaned soon after birth. All the 12 crossbred cows were randomly divided into 3 groups with 4 animals in each group according to their milk production and body weight to maintain the similarity in the trial. Daily feed intake was recorded in terms of DMI, DMI (% of BW), CP intake, CP intake (% of BW), TDN intake and ME intake and data were analyzed using the general linear model of the Statistical Analysis System (SAS 2002). Duncan's multiple range tests was used to separate treatment means. The response variables were analyzed using the statistical model:

$$Yijk = \mu + Pi + \alpha j + \beta\ (xijk - X.) + \epsilon_{ijk},$$

Results and Discussion

Dry matter intake (kg/day)

Results regarding average dry matter intake (DMI) of the animals is shown in table 1, and daily dry matter intake was recorded 8.84 + 0.34, 8.77+ 0.30 and 9.12 + 0.22 kg/d in T_1, T_2 and T_3 groups respectively (Table 1) in summer season. However, the DMI in rainy season was 2.84+ 0.09, 3.10+ 0.13 and 2.84 + 0.12 kg/d in T_1, T_2 and T_3 groups respectively (Table 1). While DMI in winter season DMI was 2.84+ 0.09, 3.10+ 0.13 and 2.84 + 0.12 kg/d in T_1, T_2 and T_3 groups respectively (Table 1). The dry matter intake was highest in winter season in all the groups and group T_1 was highest followed by T_3 and T_2 groups in rainy and winter season in terms of daily dry matter intake but in summer season T_3 group was higher than T_1 and T_2 groups. Differences between the groups were not significant (P>0.05). The results in this trial confirm those of Williams *et al.,* (1991), Wohlt *et al.,* (1991, 1998), Robinson and Garrett (1999), and Dann *et al.,* (2000), who observed that feed additives improvement in DM intake when lactating cows were fed. Supplementation with a blend of cinnamaldehyde and eugenol as a feed additive can increase DMI and milk production in lactating dairy cows (Wall 2014). However, Aikman *et al.,* (2008) observed no difference in DM intake between the control and treated cows.

When dry matter in take compared between two breeds during summer season the DMI was higher in B_1 breed (9.04+ 0.22) than B_2 breed (8.77+ 0.23). Again in rainy season

DMI was higher in B1 breed (9.13+ 0.04) than B2 breed (9.10+ 0.17) but in winter season B_2 breed was higher (9.34+ 0.21) than B_1 breed (8.95+ 0.21) in DMI (Table 2). These results are in agreement with those obtained by Ballantine *et al.,* (2002) who reported that cows fed organic mineral consumed more DM than cows receiving inorganic mineral.

Dry matter intake per cent of body weight

DMI per cent of body of cows to be expressed as changes in the DMI was observed to be 3.01+ 0.03, 2.95+ 0.05 and 2.95 + 0.10 kg/d in T_1, T_2 and T_3 groups respectively (Table 1) in summer season. In rainy season DMI per cent of body weight was 2.84+ 0.09, 3.10+ 0.13 and 2.84 + 0.12 kg/d in T_1, T_2 and T_3 groups respectively (Table 1).

In winter season DMI per cent of body weight was 2.99+ 0.02, 2.95+ 0.05 and 2.97 + 0.03 kg/d in T_1, T_2 and T_3 groups respectively (Table 1). DMI per cent of body weight was also highest in winter season in all the groups. Among all the groups during all three seasons T_2 group was highest in rainy season in respect of DMI per cent body weight. These observations were statistically similar between the groups in various treatments.

Results showed that DMI (% body weight) in summer season was same as dry matter in take, B_1 breed was higher (2.97$\pm$ 0.03) than B_2 breed (2.95$\pm$0.02) but in rainy and winter season pattern was vice-versa to DMI. In rainy season the DMI (% body weight) B_2 breed was higher (2.98$\pm$ 0.12) than B_1 breed (2.90$\pm$ 0.07) while in winter season it was higher in B_1 breed (3.00$\pm$ 0.07) than B_2 breed (2.97$\pm$ 0.02) (Table 2).

Total crude protein intake (g/day)

Total CP intake of the animals (g/day) is shown in table 1 and it intake was 1398.03 $\pm$ 17.28, 1395.15$\pm$ 9.04 and 1405.58 $\pm$ 11.83 g/d in T_1, T_2 and T_3 groups respectively (Table 1) in summer season. In rainy season CP intake of animals was 1158.08$\pm$ 21.21, 1177.93$\pm$ 21.75 and 1181.53 $\pm$ 22.91 g/d in T_1, T_2 and T_3 groups respectively (Table 1). In winter season CP intake was 1309.70$\pm$ 12.46, 1276.80$\pm$ 33.90 and 1187.73 $\pm$ 37.04 g/d in T_1, T_2 and T_3 groups respectively (Table 1)The CP intake was highest in summer season in all the groups and group T3 was highest in summer and rainy season while in winter season T_1 group was higher than T_2 and T_3 groups. Differences between the groups were not significant (P>0.05) but within the groups it was highly significant. In accordance with the present results agrees with the work of Allen (2000) who summarized that increasing CP content of the diets can increase DMI of lactating cows. These results are in agreement with the reports of Sarker (2010) who reported mixed additives showed better nutrient utilization.

The comparative study of two breeds showed that CP in take in summer season was almost similar in both breeds but in rainy season it was slightly higher in B_1 breed (1173.47$\pm$ 18.95) than B_2 breed (1171.55$\pm$16.19) and winter season CP in take was higher in B_2 breed (1279.37$\pm$15.45) than B_1 breed (1236.78$\pm$14.38) (Table 2).

Crude protein intake per cent of body weight

CP intake per cent of body weight was observed to be 376.40+ 3.87, 391.52+ 4.05 and 379.27 + 6.04 g/d in T_1, T_2 and T_3 groups respectively (Table 1) in summer season. In rainy season CP intake per cent of body weight was 341.30+ 2.69, 342.45+ 3.87 and 332.20 + 5.99 g/d in T_1, T_2 and T_3 groups respectively (Table 1). In winter season CP intake per cent of body weight was 338.92+ 3.02, 362.80+ 4.36 and 358.80 + 5.02 g/d in T_1, T_2 and T_3 groups respectively (Table 1).

CP intake per cent of body weight was also highest in summer season in all the treatment groups. Among the entire groups T_2 group was highest in summer season followed by T_3 and T_2 in terms of CP intake per cent body weight. These observations were statistically significant (P>0.05) between the groups in winter treatments but in rainy and summer results were not significant.

CP in take (% body weight) was higher B_1 breed (384.91+4.33) than B_2 breed (379.88+4.80) in summer season but in rainy season same was also higher in B_1 breed (341.71+3.31) than B_2 breed (335.58+4.11) and in winters the CP in take (% body weight) was higher in B_2 breed (354.45+6.05) than B_1 breed (352.61+ 5.29) (Table 2).

TDN intake (kg/day)

The TDN intake response of cow to control and experimental diets The average TDN intake kg/day was 7.50 $\pm$ 0.07, 7.58 $\pm$ 0.10 and 7.58 $\pm$ 0.07 kg/d in groups T_1, T_2 and T_3 respectively (Table 1) in summer season.

In rainy season TDN intake was 6.91$\pm$ 0.15, 6.81$\pm$ 0.15 and 6.75 $\pm$ 0.19 kg/d in T_1, T_2 and T_3 groups respectively (Table 1). In winter season TDN intake was 7.41$\pm$ 0.03, 7.22$\pm$ 0.20 and 7.14 $\pm$ 0.05 kg/d in T_1, T_2 and T_3 groups respectively (Table 1). TDN intake was higher in summer season among all the groups followed by winter and rainy season. Here again the values in T_2 and T_3 groups were significantly higher than T_1 group and were almost similar in summer season. But in rainy and winter season TDN intake was highest in T_1 group followed by T_2 and T_3 groups. There was no significant difference in TDN intake among the groups. These results are in accordance with those obtained by Bendary *et al.,* (2013) who reported that the seaweed treatment showed significantly (P<0.05) highest average daily intake of TDN while the lowest intake was in control treatment.

The comparison of TDN in take between two breeds showed that, in summer season breed B_1 was better (7.59$\pm$ 0.07) than B_2 breeds (7.52 $\pm$ 0.05) and in winter season also B_1 breed was better (7.30$\pm$0.12) than B_2 breed (7.20$\pm$0.08) but in rainy season TDN in take was higher in B_2 breed (6.88$\pm$0.09) than B_1 breed (6.77$\pm$0.16) (Table 2).

ME intake (Mcal/day)

The ME intake Mcal/day was 18.85 $\pm$ 0.03, 19.18 $\pm$ 0.32 and 19.42 $\pm$ 0.27 in groups T_1,T_2 and T_3 respectively (Table 1) in summer season. In rainy season ME intake was 18.12$\pm$ 0.15, 18.23$\pm$ 0.15 and 19.42 $\pm$ 0.09 Mcal/d in T_1, T_2 and T_3 groups respectively (Table 1). In winter season ME intake was 18.47$\pm$ 0.07, 18.85$\pm$ 0.10 and 18.86 $\pm$ 0.13 Mcal/d in T_1, T_2 and T_3 groups respectively (Table 1). Results showed that the ME intake was also highest in summer season among all the groups followed by winter and rainy season. The values in T3 group were significantly higher than T_2 and T_1 groups in all three seasons. There was no significant difference in TDN intake among the groups. Energy in take was higher in B_2 breed than B_1 breed in all three seasons (Table 2).

These results are agreement with Michael (2007) reported that the supplementation of feed additive in lactating cow rations are beneficial for nutrient intake ant their utilization and also improved performance of cows.

Table.1 Seasonal effect of various feed additives on feed intake of crossbred cows

Treatment groups	1 Intake (kg/day)	DM intake (% of BW)	CP intake (g/day)	CP intake (% of BW)	TDN intake (kg/day)	: intake (Mcal/day)
			Summer Season			
T_1	8.84±0.34a	2.99±0.02a	1398.03±17.28a	376.40±3.87a	7.50±0.07a	18.85±0.03a
T_2	8.77±0.30a	2.95±0.05a	1395.15±9.04a	391.52±4.05a	7.58±0.10a	19.18±0.32a
T_3	9.12±0.22a	2.97±0.03a	1405.58±11.83a	379.27±6.04a	7.58±0.07a	19.42±0.27a
			Rainy Season			
T_1	9.28±0.20^a	2.84±0.09^a	1158.08±21.21^a	341.30±2.69^a	6.91±0.15^a	18.12±0.15^a
T_2	8.87±0.08^a	3.10±0.13^a	1177.93±21.75^a	342.45±3.87^a	6.81±0.15^a	18.23±0.15^a
T_3	9.18±0.04^a	2.84±.12^a	1181.53±22.91^a	332.20±5.99^a	6.75±0.19^a	18.51±0.09^a
			Winter Season			
T_1	9.37±0.11a	3.01±0.03a	1309.70±12.46a	338.92±3.02b	7.41±0.03a	18.47±0.07a
T_2	8.89±0.42a	2.95±0.05a	1276.80±33.90ab	362.80±4.36a	7.22±0.20a	18.85±0.10a
T_3	9.17±0.16a	2.95±0.10a	1187.73±37.04b	358.87±5.02a	7.14±0.05a	18.86±0.13a

Means within the same column, with the same letters are not significantly different (P<0.05)

Table.2 Seasonal variation due to breeds on feed intake in different groups

Breed	DM Intake (kg/day)	DM intake (% of BW)	CP intake (g/day)	CP intake (% of BW)	N intake (kg/day)	: intake (Mcal/day)
			Summer Season			
B_1	9.04±0.22a	2.97±0.03^a	1399.53±11.75a	384.91±4.33a	7.59±0.07a	19.02±0.17a
B_2	8.77±0.23a	2.95±0.02a	1399.63±8.82a	379.88±4.80a	7.52±0.05a	19.28±0.24a
			Rainy Season			
B_1	9.13±0.04^a	2.90±0.07^a	1173.47 ± 18.95^a	341.71±3.31^a	6.77±0.16^a	18.23±0.16^a
B_2	9.10±0.17^a	2.98±0.12^a	1171.55±16.19a	335.58±4.11^a	6.88±0.09^a	18.34±0.07^a
			Winter Season			
B_1	8.95±0.21^a	3.00±0.07a	1236.78±41.38^a	352.61±5.29^a	7.30±0.12^a	18.71±0.12^a
B_2	9.34±0.21a	2.97±0.02a	1279.37±15.45a	354.45±6.05a	7.20±0.08a	18.75±0.10a

Means within the same column, with the same letters are not significantly different (P<0.05)

Table.3 Overall efficiency of feed additives on feed intake into experimental groups of cows

Treatment groups	DM Intake (kg/day)	[intake of BW)	(% intake (g/day)	CP intake (% of BW)	TDN intake (kg/day)	ME intake (Mcal/day)
T_1	9.16±0.14^a	2.95±0.03^a	1288.6±31.22^a	352.20±5.43^b	7.27±0.09^a	18.48±0.10^b
T_2	8.85±0.16^a	3.00±0.05^a	1283.2±29.52^a	365.59±6.43^a	7.20±0.12^a	18.84±0.18^a
T_3	9.16±0.08^a	2.94±0.05^a	1258.2±34.23^a	356.78±6.53^b	7.16±0.12^a	18.84±0.12^a

Means within the same column, with the same letters are not significantly different (P<0.05)

Efficiency of feed additives on feed intake of cows

The overall efficiency of feed additives on feed intake into experimental groups of cows was determined in all three treatment groups during all the seasons of experimental trial and results showed in table 3. The overall DMI was highest in T_1 group followed by T_3 and T_2 groups. DMI (% of body weight) was highest in T_2 group followed by T_1 and T_3 groups and in CP intake T_1 group was highest followed by T_2 and T_3 groups. The CP intake (% of Body weight) was highest in T_2 group followed by T_3 and T_1 groups and the differences were statistically different (P<0.05). TDN intake was highest in T_1 group followed by T_2 and T_3 groups and ME intake was highest and similar in T_2 and T_3 groups followed by T_1 group. Accept CP intake (% of BW) all other means were not statistically different within the groups (P<0.05). Vahora and Pandey (2006) used Jersey X Kankrej crossed lactating cows to evaluate DMI that was similar to present study, they observed a non significant difference for DMI.

In conclusion, results of the present study suggest the supplementation of feed additives in the diets increases in DMI, CP intake, total digestible nutrient intake, as well as ME intake and income over feed. The use of feed additives should be highly recommended as a feed supplement source in the ration of lactating dairy cows.

References

Allen, M.S. 2000. Effects of diet on short-term regulation of feed intake by lactating dairy cattle. *J. Dairy Sci.*, 83: 1598-1624.

Ballantine, H.T., Socha, M.T., Tomlinson, D.J., Johnson, A.B., Fielding, A.S., Shearer, J.K., and Van Amstel, S.R. 2002. Effects of feeding complexed zinc, manganese, copper, and cobalt to late gestation and lactating dairy cows on claw integrity, reproduction, and lactation performance. *Prof. Anim. Sci.*, 18: 211.

Bendary, M.M., M.I., Bassiouni, M.F., Ali, H.M., Gaafar and A.Sh. Shamas. 2013. Effect of premix and seaweed additives on productive performance of lactating friesian cows. *Int. Res. J. Agri. Sci.*, 1(1): 11-18.

Bezabih, M., Pellikaan, W.F., Tolera, A., and Hendriks, W.H. 2012. Estimation of feed intake and digestibility in cattle consuming low-quality tropical roughage diets using molasses-based n-alkane boluses. *Animal Feed Sci. Technol.*, 177(3/4): 161-171.

Dann, H.M., Drackley, J.K., McCoy, G.C., Hutjens, M.F. and Garrett, J.E. 2000. Effects of yeast culture (Saccharomyces cerevisiae) on prepartum intake and postpartum intake and milk production of Jersey cows. *J. Dairy Sci.*, 83: 123-127.

Emma, H., Wall, Perry, Doane, H., Shawn, S., Donkin, David Bravo. 2014. The effects of supplementation with a blend of cinnamaldehyde and eugenol on feed intake and milk production of dairy cows. *J. Dairy Sci.*, 97(9): 5709-5717.

Gupta, Nilin., Kumar, Anil., and Tiwari, D.P. 2005. Effect of herbs as a feed additive on nutrient utilization and growth in crossbred heifers fed paddy straw based rations. *Indian J. Animal Sci.*, 75 (1):52-55.

Hutjens, M.F. 1991. Feed additives. *Vet Clinics North Am. Food Animal Practice*, 7(2):525.

Jatkauskas, J., Vrotniakiene, V., and Urbsiene, D. 2010. Effects of a chemical additive on whole crop spring barley silage fermentation feed intake and milk production. *Animal Husbandry*, Scientific Articles. 55, 3-16.

Kim, H.S., Jung, H.Y., Lee, H.J., Ki, K.S., Cho, Y.M., Ahn, B.S., and Lee, S.S. 2002. The effect of feed additives supplement on prepartum and postpartum feed intake, milk production and metabolic disorders of dairy cows. *J. Animal Sci. Technol.*, 44(5): 561-572.

Mulder, R.W.A.W. 1991. Probiotics as a tool against almonella contamination. *Misset-World Poultry*, 7(3): 60-68.

Robinson, P.H., and Garrett, J.E. 1999. Effect of yeast culture (Saccharomyces cerevisiae) on adaptation of cows to postpartum diets and on lactational performance. *J. Animal Sci.*, 77, 988-999.

Sarker, M.S.K., Ko, S.Y., Lee, S.M., Kim, G.M., Choi, J.K. and Yang, C.J. 2010. Effect of Different Feed Additives on Growth Performance and Blood Profiles of Korean Hanwoo Calves. *Asian-Aust. J. Anim. Sci.*, 23(1): 52-60.

Vahora, S.G., and Pande, M.B., 2006. Effect of enzyme supplementation on feed utilization, blood constituents and reproduction in dairy cows. *Indian J. Animal Sci.*, 76(6): 471-475.

Williams, P.E.V., Tait, C.A.G., Innes, G.M., and Newbold, C.J. 1991. Effects of the inclusion of yeast culture (Saccharomyces cerevisiae plus growth medium) in the diet of dairy cows on milk yield and forage degradation and fermentation patterns in the rumen of steers. *J. Animal Sci.*, 69, 3016–3026.

Wohlt, J.E., Corcione, T.T., and Zajac, P.K. 1998. Effects of yeast on feed intake and performance of cows fed diets based on corn silage during early lactation. *J. Dairy Sci.*, 81, 1345-1352.

Wohlt, J.E., Finkelstein, A.D., and Chung, C.H. 1991. Yeast culture to improve intake, nutrient digestibility, and performance by dairy cattle during early lactation. *J. Dairy Sci.*, 74: 1395–1400.

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