Effect of Enzyme Supplementation on Production Performance of Dairy Animals

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A B S T R A C T

This experiment was based on the hypothesis that whether use of exogenous enzymes in ruminant diets is beneficial for feed digestion and improving animal productivity or not. For this study, total 20 cows and 20 buffaloes were selected and divided into four groups namely A, B, C and D. The trial was conducted on Private Dairy farm of Rajnandgaon District, Chhattisgarh, India where pre and post feeding effect of Hostazyme (Xylanase) was studied. The above study recommended the use of Hostazyme at 5 g per day in cows and 10 g per day in buffaloes for economic milk production.

Keywords
Enzymes, xylanase milk production, dairy

Introduction

Upon initial consideration, exogenous enzyme might be expected to alter feed utilization in ruminants either through their effects on the feed prior to consumption, or through their enhancement of digestion in the rumen and/or in the post-ruminal digestive tract, therefore, the objective of this study was to investigate the effects of exogenous enzyme preparation Hostazyme (Xylanase) on cellulytic activity in the rumen of cattle and buffalo fed ration with different amount of crude protein and fat. The use of exogenous enzymes in ruminant diets is benefit feed digestion and improves animal performance (Rust et al., 1965; Yang et al., 1998; Kung et al., 1998), but the mechanism is still complex and not very clear.

Researchers have already shown the increased feed digestion is likely not simply due to supplemental enzymatic activity, but the contribution of added exogenous enzymes to total ruminal activity is relatively small (Rovics and Ely,1962; Beauchemin et al., 1997). In a study on the relationship between rumen and exogenous enzymes found that the final hydrolytic effect exceeded the normal enzyme activity in the rumen (Morgavi et al.,
They found the synergistic interaction between exogenous enzyme preparations and rumen microorganisms.

The rumen microbial population presents a rich and until recently, underutilized source of novel enzymes with tremendous potential for ruminants. The enzyme activities confirmed to exist in the rumen are diverse, and include plant cell wall polymer-degrading enzymes. The variety of enzymes present in the rumen arises not only from the diversity of the microbial community but also from the multiplicity of fibrolytic enzyme produced by individual micro-organism (Yanke et al., 1995).

Therefore the study conducted to investigate the effect of exogenous enzyme (Hostazyme® from Huve Pharma SEA) on milk production and chemical composition of milk in cattle and buffalo in tropical conditions.

**Materials and Methods**

For this study, total 20 cows and 20 buffaloes were selected and divided into four groups namely A, B, C and D. The trial was conducted on Private Dairy farm of Rajnandgaon District, Chhattisgarh, India where pre and post feeding effect of Hostazyme was studied. Group A contained cows with average yield of 13.2 kg per day with average 110 days post calving and all 10 cows were fed similar diet of 10 kg fresh Napier green fodder, 5 kg paddy straw and 7.5 kg of concentrate ration (Table 1) on daily basis.

Group B contained 10 cows at same phase of lactation 110 days post calving and yielding 17.4 kg milk per day. All 10 cows of group B were fed 10 kg Napier, 5 kg paddy straw and 9.5 kg of concentrate (Table 1).

While groups C and D were contained 10 buffalo in each group and fed 10 kg Napier and 7.5 kg paddy straw with 7 kg of concentrate (Table 1) as daily diet. All buffaloes are in third lactation and 90 days post calving as average 9.5 kg milk yield per day.

**Table 1** Feed formula of concentrate ration offered to experimental animals

| Raw material               | Percentage |
|----------------------------|------------|
| 1 Maize                    | 43         |
| 2 Soya DOC 45%             | 13         |
| 3 Rape seed cake (Ext)     | 10         |
| 4 Mustard oil cake         | 10         |
| 5 De-Oiled Rice Bran       | 14         |
| 6 Rice Polish              | 6          |
| 7 By Pass Fat              | 2          |
| 8 Mineral Mixture          | 2          |
| **Total**                  | **100**    |
All milk record were analysed for 10 days as pre-trial period and Group A and C were fed 5gm Hostazyme per day, and Group B and D were fed 10 gm Hostazyme per day as top dressing. All rations remain same as mentioned in Table 1.

**Results and Discussion**

The supplementation of exogenous enzyme in dairy diet has significant effect on milk production in group A where 5 gm dose rate of hostazyme was added. Milk yield was significantly improved (p<0.05) (improvement of 700 g per day), and in group B where dose was kept 10 gm per day, the improvement of milk yield was non-significant (p>0.05). Effect on Fat (%) and SNF (%) was non-significant (p>0.05) in both groups A and B of cows.

In group C and D where all buffaloes were fed at 5 gm and 10 gm Hostazyme daily respectively shown non significant effect on fat and SNF percentage (p>0.05) in both group (Table 4 and 5) while milk yield improved in both group significantly (p<0.05), 0.3 kg and 0.73 kg per day respectively.

The cost of 730 gm of milk increment is much higher than the cost of feeding 10 gm of Hostazyme, which show the economic importance of feeding Hostazyme in cows and buffalo feeding.

Supplementation of ruminant diets with exogenous feed enzymes is one of the developing horizons of dairy Industry, regarding the extensive research and positive responses.

**Table.2 Production parameters of cows fed 5 gm Hostazyme per day**

| Particulars   | Milk production (kg) | Fat%  | SNF%  |
|---------------|----------------------|-------|-------|
| Pre feeding   | 13.27±0.16           | 3.6±0.031 | 8.35±0.04 |
| Post Feeding  | 13.97±0.21           | 3.6±0.042 | 8.37±0.03 |
| Difference    | 0.7                  | 0.02  | 0.02  |
| p-value       | 0.02792              | 0.3600 | 0.7650 |

**Table.3 Production parameters of cows fed 10 gm Hostazyme per day**

| Particulars   | Milk production (kg) | Fat%  | SNF%  |
|---------------|----------------------|-------|-------|
| Pre feeding   | 17.42±0.15           | 3.6±0.03 | 8.35±0.022 |
| Post Feeding  | 17.82±0.93           | 3.7±0.08 | 8.37±0.021 |
| Difference    | 0.4                  | 0.1   | 0.02  |
| p-value       | 0.68018              | 0.4600 | 0.5995 |

**Table.4 Production parameters of buffaloes fed 5 gm hostazyme per day**

| Particulars   | Milk production (kg) | Fat%  | SNF%  |
|---------------|----------------------|-------|-------|
| Pre feeding   | 9.67±0.084           | 7.2±0.026 | 9.07±0.036 |
| Post Feeding  | 9.97±0.047           | 7.3±0.022 | 9.14±0.030 |
| Difference    | 0.3                  | 0.1   | 0.07  |
| p-value       | 0.00880              | 0.6800 | 0.1517 |
The high complexity of the rumen ecosystem makes it difficult to define which, if any, enzyme activity is needed to draw out animal improved production performance (Fontes et al., 1995).

Developing new in vitro screening methods, instead of in vivo experiments can help ruminant nutrition scientists to evaluate new products and theories more precisely and economically (Gonzalez-Garcia et al., 2008). Besides, predominate understanding about the mode of action and target animal requirements could be helpful to reformulate diets with efficient influence of exogenous feed enzymes. However, more investigation is necessary to describe and observe new approaches (Doerner and White, 1990).

Exogenous enzymes have been used extensively to increase the digestibility of existing nutrients, and to supplement the activity of the endogenous enzyme. Researchers examined the use of exogenous enzymes in ruminants’ diet (Burroughs et al., 1960).

These results support the outcome of Lopuszanska-Rusek and Bilik (2011) where they observed enhanced milk production with xylanase-esterase supplementation and a tendency of improving DMI and milk production with xylanase and cellulase enzyme supplementation.

Significant increment of milk production in response to the enzyme supplementation was also observed by Klingerman et al., (2009) where the percentages of milk fat and milk protein were unaffected by treatment.

Finally it can be concluded that feeding Hostazyme (Xylanase) supplementation on cow or buffalo has significant and economic effect on milk production and can improve the profit share of dairy farmer.

Adding exogenous enzyme has economic importance for feed millers also if they considered their marketing strategy based on these results. The above study recommended the use of Hostazyme (Xylanase) at 5 g per day in cows and 10 g per day in buffaloes for economic milk production.

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