

EFFECT OF FEEDING ENZYME MIXTURE WITH FIBROLYTIC ACTIVITY IN DRY AND SOLUBULIZED FORMS ON THE PERFORMANCE OF LAMBS

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ABSTRACT

One hundred lambs (11.8 kg ± 0.56) divided at random into 4 groups G₁, G₂, G₃ and G₄ were supplemented with exogenous fibrolytic enzyme mixture (EFE) in concentrates after 6 hours outside grazing. G₁ and G₂ were given 200 and 400 g of EFE per 50 kg feed in dry form, G₃ and G₄ were given EFE in solubulized form at 20 and 40 g per litre of water, respectively. The initial and final weights (kg) were non-significant among treatments. The total weight gain (kg) was higher (P<0.05) for G₄ and G₂ as compared to other two. Average daily gain (g) was highest (P<0.05) for G₄ followed by G₂, G₁ and G₃. Total weight gain (%) is 15, 7.6 and 16.5 lower (P<0.05) for G₁, G₂ and G₃ (Table) as compared to G₄. Lowest (P<0.05) FCR was observed for G₄ and is in the order of G₄< G₂< G₁< G₃. The cost of the feed per kg gain was lower (P<0.05) by 21%, 26% and 13% for G₄ as compared to G₁, G₂ and G₃. It can be concluded that addition of EFE in solubulized form was found better for the reason that it forms a stable complex with the feed and thus facilitates for the rumen bacterial attachment earlier for rapid action due to an increase in rumen bacterial population

Key words: EFE, Solubility, ADG, FCR, performance

INTRODUCTION

In tropical countries like India, ruminant production systems are based on crop residues and more of agricultural by-products rich in fibrous material which is important for salivation, rumen buffering and efficient production of rumen end products. However, to a maximum of 65 % fibrous material in the feed stuffs are efficiently digested (Van Soest, 1994) and the remaining portion needs to be digested at least partially to follow economy. Forage digestibility has been improved by several biotechnological products like fibrolytic enzymes, ionophores, direct fed microbial products and certain fungi like *Pleurotus* which can degrade

lignin. In recent times, addition of exogenous fibrolytic enzymes (EFE) to the feed stuff has shown promising results by hydrolysis of plant cell walls (Beauchemin et al., 2004)

Morgavi et al., (2000 a) suggested that spraying fibrolytic enzymes on dry feeds improved rumen digestion because of a synergistic effect between the supplemented enzyme activity.

Rode et al., (1999) and Yang et al., (1999) reported improved in vivo digestion in lactating cows where as Kung et al., (2002) and Colobatto et al., (2003) reported the same by in vitro digestion in lactating dairy cows.

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The objective of this study was to evaluate the effect of feeding the fibrolytic enzyme mixture in dry and solubilized forms on the performance of growing lambs.

MATERIALS AND METHODS

All the 100 lambs used in this trial were bred in the farm with an average body weight of $11.8 \text{ kg} \pm 0.56$ and were divided into 4 groups (G_1 , G_2 , G_3 and G_4) at random. A commercially prepared enzyme mix containing Amylase, hemi-cellulase, xylanase, galactosidase, cellulase, protease, beta- glucanase & phytase) (SYNERZYME- P- FS - Neo Spark) was used as EFE in the present study. All the lambs were allowed for 6 hours grazing and after return were fed with concentrate mixture ad libitum by mixing EFE mixture. G_1 and G_2 were given 200 and 400 g of EFE per 50 kg feed in dry form, G_3 and G_4 were given EFE in solubilized form at 20 and 40 g per litre of water, respectively.

All the lambs were dewormed before the start of the trial. The animals had unlimited access to feed and water throughout the duration of the growth trial and were fed as groups. The daily feed offered and the left over was recorded and the body weights were recorded at weekly intervals. The present study was planned with the objective of studying the effect of feeding EFE in dry and solubilized forms on the growth performance of lambs while calculating the cost economy along with the dosage of the enzyme mix. The experiment was carried out for a period of 35 days. The data

was subjected to one –way classification of analysis of variance (Snedecor and Cochran, 1989) and the means were tested by least significant difference.

RESULTS AND DISCUSSION

The ingredient composition (%) of the concentrate mixture was 40, 22, 45, 2 and 1 for maize, GNC, DORB, mineral mixture and salt, respectively. The CP and TDN (calculated) contents (%) were 16.6 and 69.3, respectively. The initial and final weights (kg) were non-significant among treatments. The total weight gain (kg) was higher ($P<0.05$) for G_4 and G_2 as compared to other two.

Average daily gain (g) was highest ($P<0.05$) for G_4 followed by G_2 , G_1 and G_3 . It was observed that G_4 was 9.5%, 12.1% and 2.2% higher as compared to G_1 , G_3 and G_2 , respectively in terms of ADG. The groups G_2 and G_4 that are supplemented with the enzyme mix in dry form showed higher daily gain and it is to be observed that the dose of enzyme mix is also higher for these groups. Total weight gain (%) is 15, 7.6 and 16.5 lower ($P<0.05$) for G_1 , G_2 and G_3 (Table) as compared to G_4

Lowest ($P<0.05$) FCR was observed for G_4 and is in the order of $G_4 < G_2 < G_1 < G_3$. The solubilized EFE form with higher dose recorded the lowest FCR indicating the dose of the enzyme has significant effect in the feed utilization by the animals. Obviously, the cost of the feed per kg gain was lower ($P<0.05$) by 21%, 26% and 13% for G_4 as compared to G_1 , G_2 and G_3 .

Table showing the growth performance of the experimental treatments

S. No.	Parameter	G1	G2	G3	G4
1	Initial wt (kg)	11.5 ± 0.32	11.4 ± 0.61	12.9 ± 0.67	12.7 ± 0.51
2	Final wt (kg)	14.5 ± 0.32	14.1 ± 0.67	15.8 ± 0.46	15.4 ± 0.50
3	Total wt gain (kg)*	$3.06^{bc} \pm 0.15$	$3.27^{ac} \pm 0.08$	$3.02^{bc} \pm 0.07$	$3.52^a \pm 0.09$
4	ADG (g)*	$84.8^b \pm 3.30$	$90.2^a \pm 2.21$	$82.4^b \pm 3.01$	$92.3^a \pm 2.13$
5	FCR*	$3.64^a \pm 0.22$	$3.83^a \pm 0.17$	$3.30^a \pm 0.14$	$2.87^b \pm 0.14$
6	Cost of feed/kg gain (Rs)*	$58.3^a \pm 3.67$	$62.1^a \pm 2.86$	$52.9^{ba} \pm 1.76$	$45.8^{ba} \pm 2.31$

^{ab} values in a row not sharing common superscripts differ significantly * ($P<0.05$)

The solubilized EFE fed group of animals recorded higher weight gains than those fed in dry form which may be due to the pre-treatment of dry feeds with enzyme applied in liquid form created a stable feed-enzyme complex even before entering the rumen similar to the findings reported by Baeuchemin et al., (2004)

The reason for higher weight gains for solubilized EFE groups in the present study may also be attributed to how enzymes are applied to the feeds and this would be an important factor in determining the efficacy of the enzyme (Dean et al., 2006). It was reported by Colombatto et al., (2003) that enzymes differ in their ability to degrade various substrates of specific types and have different rumen stabilities (Morgavi et al., 2000 b) and probably this would be one of the reasons for inconsistent results during enzyme application to the feeds in the present study.

The improved performance for solubilized enzyme supplemented groups may be due to the fact that pre treatment of feed /substrate with enzyme caused a scarring of the fibre particles and this effect causes easier attachment of rumen fibrolytic bacteria (Morgavi et al., 2000 a). There are other possible explanations for an improved performance for the EFE added diets especially EFE applied in liquid form since formation of stable enzyme-feed complex is less prone for enzyme inactivation due to the proteolytic process in the rumen.

Nsereko et al., (2002) has reported that EFE in general indirectly increased the attachment of cellobiose and glucose utilizing bacteria along with the number in the rumen. Giraldo et al., (2008) reported that addition of EFE to the diets increased the rumen fibrolytic activity and this would be a probable reason for an increased performance. The factor of higher dosage of enzyme has shown significant effect (Reddish and Kung Jr., 2007) in the present findings since the feed/substrate attachment sites for enzymes and in turn rumen microbes has increased proportionately.

Another explanation is that addition of EFE causes partial solubilization of cell wall

components releasing reducing sugars which acts as a ready source of energy for the microbes (Mc Allister et al., 2001) thereby, their multiplication. This leads to the shortening of the lag time needed for the microbial colonization with an increase in microbial attachment (Baeuchemin et al., 2004). It was also reported that at the time of release of soluble sugars by EFE increases the production of glycocalyx by bacteria which facilitates the adhesion between bacteria themselves and between bacteria and substrate. It was also reported by Chakeredza et al., (2002) and Bala et al., (2009) that the addition of EFE was able to free the trapped nutrients in the cell wall network of roughages increasing the fermentative end products (Pinos et al., 2002) due to a change in ration of microbial bio mass and the digestible energy in the rumen

CONCLUSION

In the present findings it can be concluded that addition of EFE in solubilized form was found better for the reason that it forms a stable complex with the feed and thus facilitates for the rumen bacterial attachment earlier for rapid action. EFE also releases soluble sugars from cell wall components and aids in increasing the rumen bacterial population especially fibrolytic bacteria reducing the lag time required for bacterial colonization for their action.

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