EFFECT OF CELLULASE ENZYME SUPPLEMENTATION ON THE INTESTINAL VISCOSITY AND DIGESTABILITY OF FIBRE FRACTIONS IN LAYER CHICKEN FED ON HIGH FIBRE DIET

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ABSTRACT

A study was conducted using Single Comb White Leghorn layers to evaluate the effect of cellulase supplementation at three different levels in high fibre diet on intestinal viscosity and digestability of fibre fractions in comparision with standard and high fibre control diets. The intestinal viscosity in cellulase supplemented groups was significantly ($P<0.01$) lower than that of standard layer ration and high fibre layer ration (HFLR) fed groups. The highest digestability co-efficient for acid detergent fibre (ADF) and neutral detergent fibre (NDF) were recorded in cellulase enzyme (0.18%) supplemented group while the lowest values were observed in standard and high fibre control diets.

KEYWORDS: Enzyme, fibre, layer diet, intestinal viscosity.

INTRODUCTION

Use of alternate feed stuffs in poultry diet is limited due to the presence of certain anti-nutritional factors including non-starch polysaccharides(NSPs).These NSPs increase viscosity of intestinal content which ultimately lead to low digestibility of nutrients and low performance of birds (Bedford,1995). Exogenous feed enzymes (modern biotechnological tool) are expected to alleviate these problems (Devegowda, 1993). The present study was envisaged to assess the effect of cellulase enzyme supplementation at three different levels on the intestinal viscosity and digestability of fibre fractions in birds fed with high fibre diet.

MATERIALS AND METHODS

One hundred and fifty Single Comb White Leghorn layer chicken were randomly distributed into five treatment groups viz. T1,T2,T3,T4 and T5 with three replications in each treatment (n=10). The production trial was conducted from 20 to 40 weeks of age. Two types of ration viz; standard layer ration (SLR) as per BIS(1992) and high fibre layer ration (HFLR) with 12% crude fibre were used as experimental diets (Group T1) : Standard layer ration without cellulase, Gr T2 : High fibre layer ration without cellulase, Gr T3 : HFLR with 0.06% cellulase, Gr T4 : HFLR with 0.12% cellulase, Gr T5 : HFLR with 0.18% cellulase. The birds were housed in individual cages. Feed and water were supplied *ad libitum*. At the end of the production trial, metabolic trial of three days and feed intake and excreta voided were recorded. Six birds from each treatment were sacrificed on third day to study the intestinal viscosity of different treatment groups. The intestine was ligated at the junction of duodenum and jejunum and at the ileo-caecal junction. The intestinal content from this portion was collected in a test tube and centrifuged at 6000 rpm. The supernatant fluid was used for estimation of viscosity using Ostwald viscosity meter (Oser, 1965). Data collected were statistically analysed as per methods of Snedecor and Cochran (1967).

RESULTS AND DISCUSSION

The data in Table revealed that cellulase addition to HFLR (Gr. T3, T4 and T5) considerably reduced the intestinal viscosity and improved the digestability of fibre fractions. Among the cellulase

supplemented groups not much variation could be seen in viscosity values. Birds fed with HFLR without cellulase showed significantly (P<0.01) high value of 3.08. SLR fed group showed a medium value of 2.79 which also significantly (P<0.01) differed from cellulase supplemented groups. Irrespective of different levels of cellulase, the intestinal viscosity of cellulase supplemented groups were statistically comparable. The highest digestability co-efficient for acid detergent fibre (ADF) and neutral detergent fibre (NDF) were recorded in T5 while the lowest values were observed in T2 and T1 respectively. This trend of result is in close agreement with Satyamoorthy (1995) and Vranjes and Wenk (1995) who reported that addition of single or compound enzymes resulted in improvement in nutrients and fibre digestabilities.

Bedford and Classen (1992a,1992b) noted that xylanase supplementation in wheat based diet significantly reduced the viscosity of intestinal contents. Bedford (1995) stated that both beta-glucans and arabino-xylans exerted their negative effects on digestion in poultry by increasing the intestinal viscosity and that application of relevant enzymes will alleviate this condition. The present study is also in close agreement with above reports.

Table : Influence of cellulase supplementation on Intestinal viscosity and digestability of fibre fractions :

	Treatments				
Replicate	**T1**	**T2**	**T3**	**T4**	**T5**
Viscosity	2.79^{b} ± 0.02	3.08^{c} ± 0.09	1.82^{a} ± 0.05	1.79^{a} ± 0.08	1.81^{a} ±0.04
ADF	22.60^{a} ±1.73	22.11^{a} ±1.32	25.32^{a} ±2.26	28.12^{a} ±2.47	28.27^{a}±2.08
NDF	28.68^{a} ±1.90	32.74^{a} ±1.03	34.22^{a} ±2.82	35.03^{a} ±1.98	36.89^{a} ±1.37

Means bearing the same superscript do not differ significantly (P<0.01)

As the dietary concentration of crude fibre increases, the concentration of high molecular weight carbohydrates like NSPs increases. The NSPs are thought to create viscous solution by aggregating into large networks as a result of entanglements of large polymers (Bedford,1995). This reduced the utilisation of nutrients and consequently low performance of birds. Supplementation of relevant enzymes may break polymers into shorter ones and thereby reducing viscosity of intestinal contents and causing an improvement in the digestability of fibre fractions.

It is concluded that addition of cellulase in poultry diet might have acted upon non-starch polysaccharides of high fibre diet which may be a possible reason for reduction in the viscosity of intestinal content and improvement in digestability of fibre fractions. This study warrants further detailed experimentations on digestibility of nutrients and production performance of birds fed with different kinds of alternate feed ingredients at different inclusion levels along with supplemented feed enzymes.

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