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Effect of cellulase supplementation in feed on turkey poult performance

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Soaring high cost and sometimes non-availability of conventional feed ingredients act as major constraints in future expansion of the poultry industry. To avail energy rich starch from grains, the seed layers have to be penetrated by digestive enzymes.

The non-starch polysaccharides in digestive system act as barrier for the release of nutrients from cell or increase viscosity of digesta and restrict their absorption (Bach Knudsen 2001). Birds do not secrete enzymes to degrade the non-starch polysaccharides and hence supplementation of non-starch polysaccharide degrading enzymes will be the novel solution to overcome these adverse effects (Devegowda 1991). Many enzymes are directly responsible for enhancing the nutritive quality of various low energy cereals. Nahm and Carlson (1985) used cellulase and noted significant improvement in body weight gain. Rotter *et al.* (1989) suggested that cellulase enzyme treatment could be used throughout entire feeding period of broiler birds. Saleh *et al.* (2005) concluded that combination of cellulase, hemicellulase and pectinase effectively improved the organic matter and crude protein metabolisability and carcass yield of broilers on a maize-soybean meal diet. Inclusion of complex enzymes was recommended for broiler diets as there was improvement in body weight and feed conversion ratio (Hooge *et al*. 2010).

In this study, exogenous supplementation of fibrolytic enzyme, cellulase, was tried on 0–8 weeks brooder performance in Beltsville small white turkey poults.

Experimental design: Day-old straight run Beltsville small white turkey poults (40) were randomly divided into 2 treatments having 2 replications each with 10 poults/replicate and were reared up to 8 weeks period. Colony cages were utilized for conducting the biological experiment. Each colony cage was identified as one replicate. Feeder space, waterer space, lighting and other management conditions were identical in all treatment groups.

Supplemental enzyme: Patent cellulase enzyme from leading enzyme manufacturer was used for this research work. Freshly indented enzyme was mixed in the experimental diet at recommended level of 4.5 lakh CMC units/tonne of feed (Table 1). Experimental feeds both control and treatment, were mixed once in 15 days so as to retain enzyme activity. Enzyme was stored in tight packed container to avoid any oxidative changes

Experimental diet: The experimental diets were prepared based on analysed values of feed ingredients at the Central Feed Technology Unit, Post Graduate Research Institute in Animal Sciences, Kattupakkam, Chennai. Experimental diets

Table 1. Per cent ingredient and nutrient composition of experimental diet

Ingredients	Control	Cellulase
Maize	32	32
De-oiled rice bran	15	15
Soybean meal	33	33
Sunflower oil cake	10.4	10.4
Fish meal	8	8
Mineral mixture	0.5	0.5
Di-calcium phosphate	1.1	1.1
Total	100	100
Nutrients		
Crude protein (%)	25.91	25.91
M.E. K cal/kg	2606	2606
Crude fibre (%)	8.91	8.91
Calcium (%)	1.24	1.24
Available phosphorus (%)	0.57	0.57
Lysine (%)	1.51	1.51
Methionine (%)	0.47	0.47
Cellulase enzyme		
Inclusion level (g)	0	10
Activity CMC units/g	0	4,500

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Table 2. Effect of cellulase supplementation on turkey poults performance

Treatments	Body weight (g) mean±SE						Feed conversion ratio	Livability (%)
	2nd week	4th week	6th week	8th week				
				Male	Female	Pooled		
Control	154.15±2.72	333.37±5.88	559.78±10.33	972.60 ^{b}±15.08	757.50 ^{b}±19.94	865.89 ^{b}±11.84	3.25±0.0001	91.67
Cellulase	149.80±2.89	344.79±11.67	574.00±21.31	1110.44 ^{a}±44.13	864.44 ^{a}±5.41	987.94 ^{a}±22.03	2.84±0.24	91.67

Means within column bearing different superscripts differ significantly.

of the biological trial were iso-caloric and iso-nitrogenous.

Cellulase (4.5 lakh CMC units/tonne of feed) was incorporated in a high fibre (8.91%) low energy (2606 Kcal/kg of ME) diet, in poults between 0 and 8 weeks of age. The diet (Table 1) was formulated using deoiled rice bran and sunflower oil cake at moderately high level. The crude protein level was maintained at 25.91%. The experimental poults were fed with measured quantity of feed but *ad lib*.

Performance assessment: Brooding performance of poults (0–8 weeks of age) was assessed based on the biweekly body weight, feed consumption and livability percentage. Feed conversion ratio was calculated based on the total feed consumption and total body weight gain in respective treatments. Biweekly body weight was taken at 2nd, 4th, 6th and 8th week of age. At 8th week, sex of the bird was identified and noted for sex correction. Dead birds were subjected to necropsy examination to find out the etiology.

Statistical analysis: All the data were subjected to statistical analysis as recommended by Snedecor and Cochran (1994) to arrive at inferences.

Performance of the Beltsville small white poults fed with cellulase in low energy diet is presented in Table 2. Biweekly body weight up to sixth week was not significantly affected by the treatment. However highly significant (P<0.01) improvement was recorded in eighth week male, female and pooled body weights, in favour of cellulase supplementation. While the feed conversion ratio showed only nonsignificant improvement, no change was seen in livability.

Deoiled rice bran was incorporated in the diet as to minimize the feed cost along with exogenous supplementation of cellulase at the level of 4.5 lakh CMC units/tonne of feed which could have favourably enhanced the body weight gain from 4th week onwards. There was highly significant (P<0.01) improvement in body weight gain to the extent of getting good profit margin at eighth week of age. Devegowda (2005) stated that per cent cellulose in maize, deoiled rice bran, soybean meal and sunflower oil cake were 2.91, 14.4, 5.9 and 23.5% respectively. It could be the reason that cellulase inclusion in the computed diet improved the performance of poults.

Nahm and Carlson (1985) used cellulase sourced from *Trichoderma viridae* @ 0.008% in broiler diets containing wheat bran at 0, 10 and 20% levels and noted significant improvement in body weight gain. Rotter *et al*. (1989) reported that there was a linear improvement in weight gain (11.2%) and feed to gain ratio (8.5%) over the duration of enzyme supplementation suggesting that enzyme treatment could be used throughout the entire feeding period. It was also stated that endogenous synthesis of cellulase is not possible in the birds, physiologically. Our results in the present study coincides with the report of Senthilkumar (2003) who recorded that addition of rice bran in the enzyme mixture (containing cellulase) supplemented group increased the utilization of non-starch polysaccharide content and relatively better protein digestibility in broiler diet. In a similar biological trial with broiler diets computed with maize, deoiled rice bran, soybean meal and sunflower oil cake with cellulase containing enzyme supplementation Pattanaik *et al.* (2011) acheived lower cost of production per kg of live weight gain due to the less cost of the feed and better feed efficiency.

It can be concluded that inclusion of cellulase to high fibre low energy turkey poult diet computed with maize, deoiled rice bran, soybean meal and sunflower oil cake had improved the performance in terms of body weight and feed conversion ratio at eight weeks of age.

SUMMARY

A biological trial was conducted on straight run day-old Beltsville small white turkey poults (40, which were randomly distributed into 2 treatments having 2 replicates/treatment and 10 poults/replicate. High fibre (8.91%), low energy (2606 K cal/kg of metabolizable energy) experimental diet having crude protein content of 25.91%, and with or without cellulase supplementation (4500 CMC units/g activity, @ 10 g/100 kg of feed), was fed *ad lib.* up to 8 weeks of age. Biweekly body weight up to sixth week was not significantly affected by the treatment. However highly significant improvement was recorded in eighth week male, female and pooled body weights, in favour of cellulase supplementation. While the feed conversion ratio showed only nonsignificant improvement, no change was seen in livability. It may be concluded that it is possible to formulate cheaper enzyme-supplemented high fibre diets for turkey poults to maximize performance.

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