Study on Effect of Supplemental Exogenous Protease Enzyme in diet with reduced levels of Soybean Meal on Feed Conversion Ratio of Broilers

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Introduction

Feeding enzymes to poultry is one of the major nutritional advances in the last fifty years (Khattak *et al.,* 2006). The use of enzymes in animal feed is of great importance as using high levels of good vegetable protein sources such as Soybean meal poses certain problems like increased viscosity of gut contents, poor digestibility and poor chick performance due to its high fiber content (7.5 % CF). SBM is rich in non-starch polysaccharides (NSP) which reduce the digestibility of the SBM. Zanella *et al.* (1999) has suggested that these negative effects of NSP can be overcome by supplementation of diets with suitable exogenous enzyme preparations. Protease enzymes improve the digestibility of amino acids in a wide range of natural feed ingredients, allowing lower protein diets to be formulated without loss in animal performance.

Protease is a protein digesting enzyme that breaks down storage proteins binding starch within feed ingredients. This makes the energy from protein bound starch available to the bird to be used for productive purposes. Proteases are also effective in releasing protein anti-nutrients found in ingredients like soybean meal. This function of proteases makes proteins more available (Panda *et al.,* 1998). Protease enzyme improve the digestibility of amino acids in a wide range of natural feed ingredients, allowing lower protein diets to be formulated without loss in animal performance. Not only does such use provide cost savings for the user.

Methodology

The study was carried out at the New Bernards Animal Feeds (Pvt) Ltd at Udubaddawa, Sri Lanka.

Six hundred and thirty (630) day-old commercial *Hubbard flex* broiler chicks were used for the experiment. These 630 broiler chickens were divided into three groups each consisting 210 birds and were assigned to three dietary treatments. The initial body weights of the birds were almost similar in all three treatments and average weight was 40 g. Chicks were reared until day seven in gas brooder which has been divided into three separate compartments. Artificial light was provided until third day during the day time and night. Thereafter, the lights were switched off by considering the behavior pattern of the chicks and environmental conditions during the day time. Day seven onwards, birds were fed according to control diet and two other treatments. Each treatment consisted of three replicates, and each replicate consisted of seventy birds.

In accordance with the treatment groups of the experimental birds, all diets were formulated for two phases (Starter and Finisher diet). All diets were based on Soybean meal. Except control diet (CD), two other diets contained exogenous enzymes.

Control - Basal diet without enzyme (CD)
Treatment 1 - Basal diet with Astrozyne enzyme (AZ)
Treatment 2 - Basal diet with reduced level of SBM with Protease enzyme (P) and Astrozyne enzyme

Starter ration was given 1-28 days of age and finisher ration was given 28-38 days of age, as the feeding programme. The protein requirement of treatment 2 was 1.5% less than in control and treatment 1. Other nutrient requirements and amount of feed ingredients were same in all treatment and control diets.

Feed and water offered adlibitum during first week. Multivitamin mixture was given with drinking water in first three days of the study and after the vaccination. Birds were vaccinated with Gumboro vaccine on 14th day and 25th day. Experimental birds were exposed to similar care and management in all treatment groups throughout the experimental period. Rice husk was used as litter. Litter was mixed thourghly at three days interval.

Average body weight, Body weight gain, feed intake and mortality of birds were recorded and Feed Conversion Ratio (FCR) was calculated. Statistical analysis of the collected data were performed using one way ANOVA. All analysis were performed using MINITAB 14 software package.

Results and Discussion

Table 1: Weekly Body weight, Feed intake, FCR and Mortality of broiler birds up to 38 days of age

Variable	Age (day)	Control (CD)	Treatment 1 (CD + AZ)	Treatment 2 (CD + AZ + P)
Body weight (g)	7	179.6	177.6	179.6
	14	415	432	440
	21	767	781	801
	28	1100	1122	1150
	35	1626	1641	1717
	38	1724	1827	1936
Feed intake (g)	7	166.9	166.9	166.9
	14	603.4	600	600
	21	1102	1101	1106
	28	1740	1739	1744
	35	2645	2640	2645
	38	3253	3181	3185
FCR	7	0.93	0.94	0.93
	14	1.45	1.38	1.36
	21	1.43	1.4	1.37
	28	1.58	1.55	1.51

	35	1.62	1.6	1.54
	38	1.88	1.74	1.64
Mortality (%)	7	0.95	0	0.47
	14	0	0.47	0
	21	0	0	0.47
	28	0	0	0
	35	1.44	0	0
	38	0.97	0	0

According to the Table 1 the body weight of the chicks fed with enzyme supplement diet has become significantly different from the control. According to the ANOVA analysis the body weight also showed a significant difference ($p<0.05$) with protease enzyme supplement.

According to the Table 1 FCR was higher in control group than enzyme supplemented group. The FCR of the chicks showed a significant difference ($p<0.05$) with protease enzyme supplement.

Applied enzyme preparation had no effect on mortality of chickens in the trial. The lowest mortality was established in treatment 1, but in all groups it was below 5% (Table 1), which is considered as technologically acceptable.

Table 2: Cost of Production for 1 ton of SBM Based Starter Ration

Treatment	Feed ingredient	Amount (kg)	Price of 1 kg (Rs)	Price (Rs)	Cost
Control	SBM	300	100.00	300 × 100	30000.00
	Other feed ingredients	x	y	x × y	xy
		Total Cost			**30000.00+xy**
1	SBM	300	100.00	300 × 100	30000.00
	Astrozyne enzyme	0.5	425.00	0.5 × 425	212.50
	Other feed ingredients	x	y	x × y	xy
		Total Cost			**30212.50+xy**
2	SBM	265	100.00	265 × 100	26500.00
	Astrozyne enzyme	0.5	425.00	0.5 × 425	212.50
	Protease enzyme	0.4	2700.00	0.4 × 2700	1080.00
	Other feed ingredients	x	y	x × y	xy
		Total Cost			**27792.50+xy**

Production of reduced level of SBM based diet with protease enzyme (treatment 2) was least expensive among other rations. This is mainly due to the reduced amount of SBM in

the ration 2. By adding 0.4 kg of protease enzyme into the 1 ton of starter ration can cut-off 35 kg of SBM. The cost for other feed ingredients expenses were same for all the rations.

Conclusions

Addition of protease enzyme into the broiler ration cause to increase the animal performance by increasing weight gain and improving feed conversion. In treatment 2, protein requirement was 1.5% less than control and treatment 1, because supplementation of 0.4 kg of protease enzyme in to the 1 ton of broiler ration improve the digestibility of amino acids in SBM. Applied enzyme preparation had no effect on mortality of chickens in trials. By adding 0.4 kg of protease enzyme into the 1 ton of starter ration can cut-off 35 kg of SBM. Hence provide great flexibility in least-cost feed formulation. However, further studies are needed to investigate the effect of protease enzyme on the meat quality parameters such as color, drip loss, pH, cholesterol level, microbiological analysis and strength of meat.

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