ECONOMIC IMPORTANCE OF EXOGENOUS ENZYMES IN BROILER RATIONS

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ABSTRACT

The present study was conducted during 2006, at Akbar Poultry Farm, Tehsil Munda, Timergara, district Dir(L), North West Frontier Province of Pakistan, to investigate the economic importance of using the exogenous enzymes mixture named as Driselase-1 containing amylase, protease and cellulase in the rations of commercial *Hubbard* broiler chicks. For such purpose, 192 day-old chicks were randomly distributed into 4 main groups, A, B, C and D. Each main group was further divided into 4 sub groups contained 12 birds each. Four rations viz, I, II, III and IV were randomly allotted to these groups. The rations were containing 1 kg basal feed ingredients, added with 0, 1, 2 and 4 g/kg Driselase-1. Each ration was offered *ad libitum* twice daily. The experiment lasted for 42 days. The data were statistically analyzed, using completely randomized design. The mean values for net return per chick (NRPC) were Rs. 18.20, 20.07, 17.14 and 13.87 for the chicks in groups, A, B, C and D, respectively. No significant change ($P>0.05$) was observed among the treatments for NRPC. It was concluded that under the conditions of the present experiment, from economic point of view, addition of Driselase-1 up to 4 g/kg in broiler ration was found to be uneconomical, because of reducing net return per chick. Therefore, the use of Driselase-1 is not recommended for the local broiler producers of Timergara, district Dir(L) of North West Frontier Province.

INTRODUCTION

Enzyme is a Greek word. On literal basis, it is composed of two words, "en" and "zyme". The "en" for in and the "zyme" means a substance having the potential to help in re-aliving, arising or elevating the kinetic reactive activities of chemical substances in the body of living beings. On compositional basis all sort of enzymes, which are responsible for degrading or hydrolyzing the complex carbohydrates, proteins or fats, are organic, containing up to 98% cellular complex protein, having polypeptide binding. For acting on substance, they are entirely or absolutely specific, like the lipase can only act on fats, but not on complex carbohydrates or proteins. Similarly, carbohydrases can only act on carbohydrates, but not on fats or proteins. The main reason for such specificity of enzymes versus substrates is due to the matching or not matching the geometrical shape of the active centre (GSAC) of the enzymes versus the GSAC of the substrates. Which means that if the GSAC of enzyme is identical with the GSAC of substrates, then the enzyme will be act on such substrate, otherwise not (McDonald *et al.* 1984).

From origin point of view, enzymes could be natural or synthetic. The enzymes, which are naturally secreted by the body cells of living beings, are also termed as endogenous, while the enzymes, which are synthesized artificially and are administered to the farm animals as a non nutrient feed additives are also called as exogenous enzymes (Mikulski, 1999).

In all living beings enzymes are helping in the digestion, absorption, anabolism and catabolism of feed nutrients (McDonald *et al.* 1984).

There are many factors, which can directly or indirectly affect the enzyme activities, such as substrate versus enzymes concentrations, enzyme versus substrate concentrations, enzyme inhibitors like para amino benzoic acid (PABA), temperature and pH etc. (Abdulkarim, 1999; Marsman, 1995).

The mechanism of enzyme action is, firstly to form a complex between itself and the substrate, secondly, to cause the break down in the molecular structure of the substrate, without changing itself (McDonald *et al.* 1984).

The early usage of enzymes in industrial and agricultural fields is very slow, because of the lacking of understanding about enzyme kinetics and their requirements for minimum and maximum activities in applied situation. It is well known that all digestive reactions in the digestive tract of poultry, except physical one, are related to enzymes, either directly or indirectly. In order to increase as much as possible, the digestibility of the valuable materials as a feed, only a few percent improvement of feed value could bring a big profit for the commercial broiler farmers.

From such point of view, studies on the enzyme application to the feed industry have been made since 1960 mainly in USA (Baker 1956, Jensen *et al.* 1957 and Perry *et al.* 1966).

A review of the literature shows that no local research work has been carried out on using Driselase-1 enzymes (amylase, protease and cellulase mixture) in the broiler ration. Each kg of Driselase-1 powder contains cellulase 1,000,000 units, amylase 700,000 units and protease 450,000 units.

It was hypothesized that if a mixture of amylase, protease and cellulase enzymes (Driselase-1, recently introduced in Pakistan from Han Dong Co. Ltd. Korea) is added in the broiler rations, it would increase the rate

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of digestion of starch, protein and cellulose. This in turn, would improve the net return per chick more than those fed control diets.

MATERIALS AND METHODS

The present study was carried out at Akbar Poultry Farm, Tehsil Munda, Timergara, district Dir(L), North West Frontier Province of Pakistan during 2006.

Experimental Design

The experiment was carried out using completely randomized design (CRD), where 4 experimental rations containing 4 different levels of enzymes mixture were randomly allotted to 4 different groups having 12 chicks per sub groups or replicates. The main groups were named as A, B, C and D. while the experimental rations were termed as I, II, III, and IV. The levels of Driselase-1 were 0, 1, 2 and 4 g/kg of basal feed ingredients (Tables I-II).

Selection of Experimental Chicks

Three hundreds day-old commercial *Hubbard* broiler chicks were purchased from the local market. Out of these 300 hundreds, 192 chicks were selected on the basis of homogeneous weight of chicks, in replicates for the experiment. The birds were raised using deep floor litter system.

In order, to assess the effectiveness of the various levels of enzymes mixture on the performance of the experimental chicks, the following parameters were studied.

Gain in Body Weight

The gain in body weight for each group of chicks was recorded on weekly intervals by subtracting the values of initial body weight in grams from the grams values of final weight.

Feed Consumption

The feed was offered *ad-libitum* twice daily and the refusal was collected and weighed on the next morning. Feed consumption was calculated for each group by subtracting the quantity of feed refused from the quantity of feed offered.

Economics

The mean values for net return per chick (NRPC) per group were calculated as:

NRPC = O - I

Where,

O = cost of output = Mean gain in body weight (g)/chick/group x cost (Rs)/kg live weight

I = cost of input = Mean feed consumed (g)/chick/group x cost (Rs)/kg ration

Data Analysis

The data for the above parameters were statistically analysed using the standard procedures of analysis of variance using CRD, as described by Steel and Torrie (1981). The mean values were compared for significance of difference with the LSD procedure (Steel and Torrie, 1981). The statistical package (SAS, 2007) was used to perform the above analysis on computer.

Statistical Modal $Yij = \mu + Tj + \sum ij$

Yij = ith observation of jth treatment.

Tj = Effects due to treatment.

$\sum ij$ = Experimental or random error.

μ = Over all mean (mean effect).

Table I ***Composition of starter rations***

Ingredients	Ration I	Ration II	Ration III	Ration IV
Driselase-1(g)	0	1	2	4
Wheat bran (g)	200	200	200	200
Corn (g)	400	400	400	400
Fish meal (g)	50	50	50	50
Soybean meal (g)	100	100	100	100
Rice (g)	40	40	40	40
Vegetable oil (g)	50	50	50	50
Blood meal (g)	20	20	20	20
Corn gluten meal (60%) (g)	100	100	100	100
Di-calcium Phosphate (g)	19	19	19	19
Lime stone (g)	12.5	12.5	12.5	12.5
Salt (g)	2	2	2	2
Vitamin Minerals Premix (g)	5	5	5	5
Lysine (g)	0.06	0.06	0.06	0.06
Methionine (g)	1.44	1.44	1.44	1.44
Total	1000	1000	1000	1000
Nutrient composition				
ME (Kcal/kg)	2895.9	2895.9	2895.9	2895.9
Crude protein	22.82	22.82	22.82	22.82
Crude fibre	7.72	7.72	7.72	7.72

Table II ***Composition of finisher rations***

Ingredients	Ration I	Ration II	Ration III	Ration IV
Driselase-1(g)	0	1	2	4
Wheat bran (g)	200	200	200	200
Corn (g)	420	420	420	420
Fish meal (g)	50	50	50	50
Soybean meal (g)	100	100	100	100
Rice (g)	30	30	30	30
Vegetable oil (g)	60	60	60	60
Blood meal (g)	20	20	20	20
Corn gluten meal (60%) (g)	80	80	80	80
Di-calcium Phosphate (g)	19	19	19	19
Lime stone (g)	12.5	12.5	12.5	12.5
Salt (g)	2	2	2	2
Vitamin Minerals Premix (g)*	5	5	5	5
Lysine (g)	0.06	0.06	0.06	0.06
Methionine (g)	1.44	1.44	1.44	1.44
Total	1000	1000	1000	1000
Nutrient composition				
ME (Kcal/kg)	2956.5	2956.5	2956.5	2956.5
Crude protein	21.402	21.402	21.402	21.402
Crude fibre	7.722	7.722	7.722	7.722

RESULTS AND DISCUSSION

The mean values for NRPC per group were Rs. 18.20, 20.07, 17.14 and 13.87 for chicks in groups A, B, C and D, respectively and fed rations I, II, III and IV, containing Driselase1 @ 0, 1, 2 and 4 g/kg ration, respectively. No significant change ($P>0.05$) was observed among the treatments for NRPC (Table III).

It was hypothesized that if a mixture of amylase, protease and cellulase enzymes like Driselase-1, added in the rations of experimental chicks; it would increase the rate of digestion of starch, protein and cellulose. This in turn, would improve the net return per chick more than those fed control diets. This hypothesis was found to be false, as the enzymes addition did not show any improvement in NRPC.

The results of the present study are contrary with those achieved by Swain (1996) who calculated the cost benefit analysis of broiler fed on high fibre ingredients added wit protease, cellulase, amylase, pectinase and lipase. It was observed that the cost of production of 1 kg live weight of chicks fed low fibre diet was Rs 13.68, whereas, for producing the same live weight gain of chicks fed high fibre diet with enzymes, the cost was Rs 13.56. Therefore, in the production of 1 kg live weight in broilers fed high fibre diet with enzymes, there was a saving. Hence, it was suggested that for large scale production of broilers, using high fibre ingredients such as rice barn, wheat barn and sunflower cake along with the enzymes could be economical.

Moreover, the present findings are not in agreement with results of many other researchers, such as Yoshito *et al.* 1978; Campbell and Bedford 1992; Stevens *et al.* 1988; Salih, 1990; Kralik, 1993; Mahagna, 1995; Ronal *et al.* 1996, who reported that the enzymes addition in the broilers diets had successfully improved the mean values for NRPC.

The obvious reasons that why the present findings are not coinciding with the findings of the above researchers, could possibly be (i) the added enzymes (Driselase-1) concentrations was might be not enough to compensate the endogenous enzymes, therefore, the chicks fed Driselase-1 added rations did not show any improvement in the output parameter, such as gain in body weight as compared to the birds fed no Driselase-1 added rations. Based on these results further research work is suggested to be conducted for comparing the higher levels of Driselase-1, above 4g/kg in the broiler rations, at finisher stage (ii) or there could be any other hidden factor like loss of potency of enzymes, which affected the activities of the Drislease-1 containing enzymes during finisher phase.

Base on the findings of the present study, it is concluded that under the conditions of present experiment, from economic point of view, addition of Driselase1 up to 4g/kg ration for commercial broilers is found to be uneconomical.

Table III ***Effect of various levels of enzymes on net return per chick***

Groups	A	B	C	D	LSD	P values	
Rations	I	II	III	IV			
Enzymes g/kg feed	0	1	2	4			
Cost (Rs)/kg feed	20.75	20.50	22.00	23.50	4.61	0.056	NS
Mean feed Intake/bird (g)	2125.5	2056.5	2125.8	2149.0	97.97	0.061	NS
Feed intake cost (Rs)/chick	44.20	43.05	46.86	50.53	7.97	0.055	NS
Cost (Rs)/kg live weight	40.00	40.00	40.00	40.00			
Mean weight/bird (g)	1560	1577.5	1596.5	1607.5	53.97	0.065	NS
Sale (Rs)/bird	62.40	63.12	64.00	64.4	2.75	0.053	NS
Net return/Chick (Rs)	18.2	20.07	17.14	13.87	8.03	0.073	NS

NS = not significant at 5% level

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