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ORIGINAL ARTICLE

Effect of Polyzyme in Broilers Fed with Corn (*Zea mays L.*) Bran-Based Diets

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ABSTRACT

One hundred and fifty broilers were randomly assigned to 5 dietary treatments of 3 replicates each. Five diets (Diet 1: basal, corn-based, with no Polyzyme enzyme; Diet 2: 20% corn bran with Polyzyme; Diet 3: 20% corn bran without Polyzyme; Diet 4: 40% corn bran with Polyzyme and Diet 5: 40% corn bran without Polyzyme) were formulated and offered to the birds. The aim was to compare the performance of the birds on the enzyme-supplemented diets and the un-supplemented diets with those on the corn-based diets. Feed intake and weight gain were significantly ($P < 0.05$) higher in birds on the enzyme-supplemented diets compared to those on the basal diets or diets without enzyme supplementation. There was no significant difference in the apparent nutrient digestibility among the 5 dietary treatments. The results indicated that corn bran can be incorporated in broiler feed at 40% with supplementation with enzyme without any deleterious effect on the birds.

Key words: Broilers, corn bran, performance, Polyzyme.

Introduction

Corn (*Zea mays L.*) is one of the most important crops in Iran and is cultivated for different purposes such as grain for food, feed and processing, and as green corn for silage or biogas production, thus having an impact on key sectors such as livestock and energy production. It is either grown as continuous corn or in rotation with other crops. Corn constitutes the main energy source in formulated feeds for broilers in Iran. It represents about 45-55% of most poultry diets [2]. Over the years, the increase in the price of corn among other ingredients, due in part to the competition for it between man and livestock, has caused a rise in the price of poultry feed and consequently poultry products. There is thus the need to search for alternative energy sources that are cheaper than corn and readily available. The incorporation of agro-industrial by-products (AIBs) in poultry feeds hold tremendous potential in alleviating the critical situation of high cost and inadequate supply of feed

[3,9]. These AIBs however cannot be included in poultry feeds at high levels because they contain high amounts of non-starch polysaccharides (NSPs) which can account for some 70 – 95% of the cell wall [13]. These NSPs are such that the enzymes present in the gastrointestinal tract of the bird cannot fully digest or absorb [5]. Exogenous enzymes, added to the feed or used during feedstuff processing, have the ability to improve feed efficiency, reduce pollution associated with poultry manure and increase the use of low cost ingredients [6]. Among the enzymes, Solid State Fermentation (SSF) enzymes act synergistically and improve digestibility of feed, availability and utilization of nutrients. SSF enzymes shall provide additional nutrients such as organic minerals, vitamins and UGF. The substrate used in SSF enzymes are normally used in feed production therefore SSF enzymes are easily accepted by the animals. This study reports the supplementation of corn bran-based diets with an enzyme preparation (Polyzyme) on the performance of broilers.

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Materials and Methods

Management of Experimental Birds:

The experiment was conducted at a Private Poultry Unit in Malayer, Iran. Corn bran used in the study was obtained from a local market. Polyzyme (Synergistically acting poly-enzyme complex produced from a single substrate by SSF technique) used for the study was manufactured and provided from Zeus Biotech Limited, Mysore, India. One hundred and fifty day-old broiler chicks (Cobb 500 Strain) used for the feeding trial were obtained from a local hatchery in Hamadan. The birds were given a commercial diet for 7 days after which they were randomly assigned to 5 dietary treatments with 3 replicates each. Each replicate had 10 birds. Five diets were formulated each for the starter and finisher phases. Diet 1 had no corn bran and served as the control. Diet 2 contained 20% corn bran and was supplemented with Polyzyme. Diet 3 contained 20% corn bran without the enzyme. Diet 4 contained 40% corn bran and was supplemented with the enzyme and diet 5 contained 40% corn bran without the enzyme. Polyzyme was added to the diets at the rate of 400g/tonne of feed. The initial weights of the birds were taken at the beginning of the feeding trial and subsequently on a weekly basis. They were given the starter diets for 21 days after which they were switched to the finisher diets which they were fed for another 28 days.

Digestibility Studies:

At the end of the finisher phase, 2 birds per replicate were kept in metabolic cages and their excreta was collected for 5 days (after a 4-day acclimatization period). The excreta samples were oven-dried at 70°C for 48 hours. The oven-dried samples were then ground in a 1mm sieve and kept for laboratory analysis in order to determine the apparent nutrient digestibility.

Chemical Analysis:

Samples of the test diets and excreta were analyzed for proximate composition using the procedure of A.O.A.C. [1].

Statistical Analysis:

Data were analyzed by Analysis of Variance (ANOVA) procedure of [15]. The means were separated using the Duncan Multiple Range Test.

Results:

Diet Composition:

The gross composition of the experimental starter

and finisher diets are shown in Tables 1 and 2 respectively. The crude fiber values of the diets increased as the dietary inclusion of corn bran increased. However the energy values decreased as the level of corn bran inclusion in the diets increased.

Performance Characteristics of Broilers Fed Corn Bran-based Diets with or Without Polyzyme:

Results of the performance of broilers fed the experimental diets with and without Polyzyme are shown in Table 3. Significant differences were observed in the weight gain and feed intake of the birds with birds on diet 4 (40% corn bran with Polyzyme) having the higher feed intake and weight gain (5603.23g and 2250.50g respectively) than birds on the other diets. Birds on the enzyme-supplemented diets (at both levels of corn bran inclusion) recorded significantly higher weight gain and feed intake than those on the un-supplemented diets. No significant differences were observed in the final weight and feed conversion ratio of the birds on all the dietary treatments. Except for birds on diet 2 (20% corn bran Polyzyme), feed intake was higher for birds on the experimental diets than for birds on the control diet. Birds on diet 3 (20% corn bran without enzyme) recorded the lowest feed conversion ratio- 2.24 while birds on diet 5 (40% corn bran without Polyzyme) had the highest feed conversion- 2.59.

Apparent Nutrient Digestibility:

The results of the apparent digestibility of nutrients in broilers fed the different diets are shown in Table 4. The results show that there was no significant difference in all the parameters studied. In numerical terms however, diet 2 (20% corn bran with Polyzyme) had the highest digestibility values: dry matter digestibility of 79.25%; crude protein digestibility of 71.68%; crude fiber digestibility of 54.08%; ether extract digestibility of 59.79% and ash digestibility of 72.15%. It was also observed that birds on the enzyme-supplemented diets utilized the feeds better than those on diets without enzyme-supplementation.

Discussion

Performance Characteristics:

Results of the performance of broilers on the different diets showed that birds on the enzyme-supplemented diets recorded higher weight gain than those on diets without enzyme supplementation. Except for birds on diet 3 (20% corn bran without Polyzyme), feed intake was higher for birds on the corn bran diets than for birds on the control diet. This could be explained with the fact that when fibrous feed ingredients are fed to birds, there is an

Table 1: Gross composition (g/100g) of experimental broiler starter diets (n = 3 replicates of 10 birds each).

Ingredients	Control	20% MB	20% MB	40% MB	40% MB
		+ Enzyme	- Enzyme	+ Enzyme	- Enzyme
Corn	56.00	36.00	36.00	16.00	16.00
Corn bran	-	20.00	20.00	20.00	20.00
SBM	20.00	20.00	20.00	20.00	20.00
GNC	17.30	17.285	17.30	17.285	17.30
FM (72%CP)	1.00	1.00	1.00	1.00	1.00
Oyster shell	1.00	1.00	1.00	1.00	1.00
Bone meal	3.00	3.00	3.00	3.00	3.00
Lysine	0.85	0.85	0.85	0.85	0.85
Methionine	0.35	0.35	0.35	0.35	0.35
Salt	0.25	0.25	0.25	0.25	0.25
Broiler Premix*	0.25	0.25	0.25	0.25	0.25
Polyzyme	-	0.015	-	0.015	-
Total	100.00	100.00	100.00	100.00	100.00
Calculated Nutrients					
CP (%)	22.51	22.30	22.31	22.10	22.11
CF (%)	3.30	5.29	5.30	7.29	7.30
ME (kcal/g)	2.95	2.75	2.76	2.57	2.58

Table 2: Gross composition (g/100g) of experimental broiler finisher diets (n = 3 replicates of 10 birds each).

Ingredients	Control	20% MB	20% MB	40% MB	40% MB
		+ Enzyme	- Enzyme	+ Enzyme	- Enzyme
Corn	63.00	43.00	43.00	23.00	23.00
Corn bran	-	20.00	20.00	40.00	40.00
SBM	20.00	20.00	20.00	20.00	20.00
GNC	10.30	10.285	10.30	10.285	10.30
FM (72%CP)	1.00	1.00	1.00	1.00	1.00
Oyster shell	1.00	1.00	1.00	1.00	1.00
Bone meal	3.00	3.00	3.00	3.00	3.00
Lysine	0.85	0.85	0.85	0.85	0.85
Methionine	0.35	0.35	0.35	0.35	0.35
Salt	0.25	0.25	0.25	0.25	0.25
Broiler Premix*	0.25	0.25	0.25	0.25	0.25
Polyzyme	-	0.015	-	0.015	-
Total	100.00	100.00	100.00	100.00	100.00
Calculated Nutrients					
CP (%)	20.06	19.85	19.86	19.65	19.66
CF (%)	2.90	5.08	5.09	7.08	7.09
ME (kcal/g)	3.00	2.80	2.81	2.62	2.63

increase in feed intake resulting from birds trying to satisfy their energy requirements [2]. Birds on the enzyme-supplemented diets showed better growth than birds on the diets without enzyme supplementation. This could be attributed to the fact that the Polyzyme broke down the fiber component in the feed thereby making available the nutrients to the birds. This report is in line with the report of McNab and Smithand [10] that SSF enzyme complements the digestive enzymes of poultry to enhance the utilization of non-starch polysaccharides in cereals and their by-products. It could also be associated with an improved retention of protein and crude fiber. The increased weight gain and feed intake observed in the experiment are in agreement with the findings of Pourreza *et al.* [14]. The authors reported that a supplemental enzyme (a xylanase) significantly improved the body weight (BW), body weight gain (BWG), feed intake (FI) and feed conversion ratio (FCR) in broiler chicks maintained on triticale (a viscous cereal). The increase in feed intake in the birds on the enzyme-supplemented diets corroborates the earlier report of Tuleun *et al.* [17] that enzyme supplementation enhanced feed intake by broilers.

Apparent Nutrient Digestibility of Broilers Fed Graded Levels of Corn Bran-based Diets with and Without Polyzyme:

The results of the apparent digestibility of nutrients in broilers fed the different diets showed that birds on the enzyme-supplemented diets utilized the feeds better than those on diets without enzyme-supplementation. The observed increased crude protein, crude fiber and fat digestibility in this case is supported by the reports of Noy and Sklan [12]; Vukic and Wenk [18] and Taibipour and Kermanshahi [16] that apparent metabolizable energy, lipid digestibility and protein digestibility were all significantly improved when arabinoxylanase and beta-glucanase enzymes were added to wheat-soybean meal-based diets. The results are also in agreement with the findings of Han [8] who reported that a commercial enzyme preparation (CEP) improved dry matter digestibility (DMD), organic matter digestibility (OMD) and apparent protein digestibility (U-APD) in chicks fed a barley-based diet. Myashauskene *et al.* [11] also reported that the use of an enzyme in broiler feed caused greater proteolytic activity in the stomach and duodenum that

Table 3: Performance characteristics of broilers fed corn bran-based diets with or without Polyzyme.

Parameter	Control	20% MB + Enzyme	20% MB - Enzyme	40% MB + Enzyme	40% MB - Enzyme	SEM
Initial Weight (g)	121	120	121	119	120	
Final Weight (kg)	2.33	2.34	2.32	2.37	2.31	20.6
Weight gain (kg)	2.21 ^b	2.22 ^{ab}	2.20 ^c	2.25 ^a	2.18 ^{bc}	13.4
Feed Intake (kg)	5.25 ^d	4.97 ^c	5.30 ^e	5.60 ^a	5.59 ^b	25.2
FCR	2.38	2.24	2.41	2.49	2.59	0.02

abc: means along the same row with different superscripts are significantly different (p < 0.05).

Table 4: Apparent nutrient digestibility in broilers fed graded levels of corn bran-based diets with or without Polyzyme.

Parameter	Control	20% MB + Enzyme	20% MB - Enzyme	40% MB + Enzyme	40% MB - Enzyme	SEM
Dry matter	82.1	79.3	79.2	74.2	73.2	4.74
Crude protein	69.9	71.7	70.8	68.7	64.1	3.63
Crude fiber	48.1	54.1	48.2	50.5	46.5	3.59
Ether extract	60.7	59.8	55.5	55.0	55.2	3.68
Ash	72.6	72.2	71.4	72.2	71.6	0.61

ultimately improved the digestibility of crude protein. Of the nutrients, the least digested was the crude fiber with digestibility values lowest in birds on diet 5 (40% corn bran without Polyzyme). This could be attributed to the fact that the corn bran content was high and also because the diet had no enzyme added to it.

Conclusion:

With supplementation at 400g/tonne, corn bran can be incorporated in the diets of broilers at 40% level without eliciting any deleterious effects on growth and performance. Looking at the high cost of corn and its scarcity sometimes, corn bran-based diets supplemented with Polyzyme fed to broilers can help to reduce the cost of production. However, considering the final live weight, weight gain, feed conversion ratio, cost and other parameters, it is more economical to incorporate corn-bran in the diet of broiler at 20% level supplemented with Polyzyme.

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