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Effect of Commercial Enzyme (Natugrain) Supplementation on the Nutritive Value and Inclusion Rate of Guar Meal in Broiler Rations

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Abstract: A study was conducted to determine the effect of commercial enzyme (Natugrain) supplementation on the nutritive value and inclusion rate of guar meal in broiler rations. Eight isocaloric and isonitrogenous starter rations were prepared having ME 2800 Kcal/kg and CP 20%. In similar way 8 isocaloric and isonitrogenous finisher rations were prepared having ME 2900 Kcal/kg and CP 19%. 240 one day old broilers were divided into two groups I and II. Group I was further divided into 4 sub groups A, B, C and D which were fed enzyme supplemented rations containing 0, 5, 10 and 15% guar meal, respectively. The dose of enzyme was 100 gram/ton of feed. Group II was also divided into 4 sub groups E, F, G and H which were fed rations without enzyme supplementation containing 0, 5, 10 and 15% guar meal, respectively. Each sub group had 30 chicks, 3 replicates of 10 chicks. For groups A, B, C, D, E, F, G and H average values of feed consumption were 3631.2, 3797.16, 3601.0, 3086.56, 3664.33, 3736.2, 3604.93 and 3254.83 grams, average values of weight gain were 1817.77, 1813.6, 1648.77, 1169.0, 1796.1, 1723.9, 1538.44 and 1265.9 grams, average values for FCR were 1.97, 2.0, 2.17, 2.64, 1.99, 2.14, 2.33 and 2.56, values of dressing percentage were 67.5, 64.13, 64.07, 61.73, 66.20, 63.33, 63.70 and 61.33%, cost per kg live weight gain was Rs. 25.94, 26.82, 28.27, 35.36, 26.16, 27.65, 29.98 and 33.69, respectively and mortality percentage in these groups was 3.33, 0, 0, 13.33, 3.33, 0, 3.33 and 6.66%, respectively. It was concluded that guar meal reduced weight gain, dressing percentage of chicks and deteriorates FCR. Furthermore, addition of enzyme did not result in significant improvement in feed consumption, weight gain, FCR and dressing percentage, however economics was improved with enzyme addition but 15% guar meal with enzyme prove to be least efficient.

Key Words: Guar meal, Enzyme supplementation, Inclusion rate, Natugrain

Introduction

Protein is an important constituent of a balanced diet. Protein from poultry origin rich in all essential amino acids, free from toxic material and easily assimilated in the body. The nutritional value of vegetable protein sources depends upon their chemical composition as well as on the extent to which nutrients are digested and absorbed in the body. Lack of appropriate enzymes in the gastro intestinal tract and presence of anti-nutritional factors are hampering the digestion, absorption and utilization of nutrients. The guar meal is the by product of guar seed which is obtained after

the mechanical separation of endosperm from both hulls and germs of guar seed. It contains high protein 35-45%, which is high in lysine and methionine (Couch *et al.*, 1966). Guar meal contains two deleterious factors. The first is the residual guar gum, which is about 18% of the guar meal (Bakshi *et al.*, 1964). It has deleterious effect on growth rate and feed efficiency of broiler chicks if added in high concentration (Brocher and Ackerson 1950; Saxena and Pradhan 1974). The other is the trypsin inhibitor, which inactivates the pancreatic proteolytic enzymes i.e. trypsin and chymotrypsin in the gut (Birk, 1989). The major

antinutritional factor in guar meal is guar gum, a "galactomannan". It is a polymer of D-Mannose linked β -1, 4 with D-galactose attached to alternate mannose units α -1, 6. Guar gum contains 8-14% moisture, 75-85% galactomannan, 5-6% protein, 2-3% fiber and 0.5-1.0% ash (Maier *et al.*, 1993). It is sticky in nature and reduces the nitrogen retention, energy utilization and fat absorption from the gut and thus depresses the growth and increases mortality in broilers (Anderson and Warnick, 1964). High concentration of guar gum in the poultry diets slowed the absorption of amino acids through the intestinal wall (Katoch *et al.*, 1971). Despite of these deleterious effects guar meal is cheaper and have good source of essential amino acids (Ramakrishnan, 1957). The amino acid content of the guar meal protein makes guar meal a useful protein supplement for chicks and hens (Van Etten *et al.*, 1961). The growth depressing properties of the guar gum and pectin were overcome when treated with enzymes capable of hydrolyzing them namely pectinase, cellulase or a preparation from sprouted guar beans (Vohra and Kratzer, 1964). When the autoclaved guar meal supplemented with commercial cellulase and kartinase it will give growth rates equivalent to soybean meal (Brocher and Ackerson, 1950). Supplementation of enzymes to the poultry diets containing guar meal was a promising way to remove guar gum (Vohra and Kratzer, 1964;1965). Enzymes destroy the anti nutritional properties present in feed which may include single compound or class of compounds (Chesson, 1987).

The study was designed to determine the effect of commercial enzyme (Natugrain) on growth depressing activity of guar meal and to find the appropriate inclusion rate of guar meal in diets for broilers.

Materials and methods

The experiment was conducted at Department of Animal Nutrition, University of Veterinary and Animal Sciences, Lahore. One day old 240 chicks were randomly divided into 2 main groups. Each main group will be further divided into 4-sub groups having 30 chicks (3 replicates of 10-chicks) in each sub group.

Eight isonitrogenous and isocaloric experimental starter rations A, B, C, D, E, F, G and H were formulated having ME 2800 Kcal/kg and CP 20%. Eight isonitrogenous and isocaloric experimental finisher rations A, B, C, D, E, F, G and H were formulated having ME 2900 Kcal/kg and CP 19%. Rations A, B, C and D were formulated by using guar meal and enzyme. In these rations levels of guar meal were 0, 5, 10 and 15%, respectively and level of enzyme was 100g/ ton of feed. Rations E, F, G and H were formulated by using guar meal without enzyme. In these rations levels of guar meal were also 0, 5, 10 and 15%, respectively.

Ration A and E were act as control rations. The chicks were reared in battery brooders from 0-28 days and then in the grower batteries for the rest of the period i.e. 29-42 days. In the 1st week the room temperature was at 95 °F with a decrease of 5 °F each week till it becomes 70 °F, which was maintained up to the end of the trial. The room was properly ventilated. Light was provided for 24 hours. Ad-libitum feed and water was offered to all chicks. All the birds were vaccinated against the important diseases. The parameters studied were feed consumption, weight gain, FCR, dressing percentage, mortality and economics. Data obtained was statistically analyzed by (4x2) factorial arrangement by using SAS computer program and Duncan multiple range test (DMR) was applied to compare the means (Steel and Torrie, 1982).The composition and calculated nutrient profile of rations were shown in the Tables 1, 2, 3 and 4.

Results and Discussion

Mean values of feed consumption, weight gain and FCR at 28 days of age have been shown in the table 5 and mean values of feed consumption, weight gain, FCR, dressing percentage, mortality and cost per kg live weight gain at the end of experiment (at 42nd day) have been shown in the Table 6.

The average feed consumed by the broiler chicks fed on rations A, B, C, D, E, F, G and H was 3631.2, 3797.16, 3601.0, 3086.56, 3664.33, 3736.2, 3604.93 and 3254.83 grams per bird respectively. The highest feed

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Table 1: Composition of broiler starter rations

Ingredients	Rations With Enzyme Supplementation				Rations Without Enzyme Supplementation			
	A (%)	B (%)	C (%)	D (%)	E (%)	F (%)	G (%)	H (%)
Corn	36.60	36.80	37.00	40.40	36.60	36.80	37.00	40.40
Rice Tips	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Rice Polish	12.00	12.00	12.00	8.00	12.00	12.00	12.00	8.00
Canola Meal	6.10	2.90	2.00	2.00	6.10	2.90	2.00	2.00
Guar Meal	--	5.00	10.00	15.00	--	5.00	10.00	15.00
Sunflower meal	4.00	4.00	2.10	1.00	4.00	4.00	2.10	1.00
Corugluten 60%	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Soybean Meal	18.30	16.10	13.70	10.30	18.30	16.10	13.70	10.30
Molasses	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
DCP	1.66	1.69	1.74	1.78	1.66	1.69	1.74	1.78
Limestone	1.00	1.10	1.00	1.00	1.10	1.10	1.00	1.00
L-Lysine	0.21	0.26	0.30	0.35	0.21	0.26	0.30	0.35
D.L. Methionine	0.13	0.15	0.16	0.17	0.13	0.15	0.16	0.17
Premix	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Natugrain (grams in 100 kg)	10.0	10.0	10.0	10.0	-	-	-	-

Table 2: Nutrient profile of starter rations

Ingredients	A	B	C	D	E	F	G	H
M.E (Kcal/Kg)	2800.00	2800.00	2800.00	2800.00	2800.00	2800.00	2800.00	2800.00
C.P. (%)	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
E.E. (%)	3.77	3.89	4.09	3.87	3.77	3.89	4.09	3.87
C.F. (%)	4.12	4.03	3.75	3.66	4.12	4.03	3.75	3.66
Ca	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Av. P	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
Lysine	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Methionine	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48
Linoleic Acid	1.42	1.53	1.64	1.64	1.42	1.53	1.64	1.64
Price / Kg. (Rs.)	9.47	9.44	9.41	9.38	9.35	9.33	9.29	9.27

consumption was 3797.16 grams on ration B (5% guar meal with enzyme). While the lowest feed consumption was 3086.56 grams on ration D (15% guar meal with enzyme). There was non significant ($P>0.05$) difference among different experimental groups as far as enzyme supplementation was concerned. However, highly significant ($P<0.05$) differences were observed in feed consumption among the experimental groups on the basis of different levels of guar meal. It was observed that the feed consumption by the chicks was decreased as the level of guar meal was increased. These results are in accordance with the findings of Verma and McNab (1982); Khan (1996), who reported that feed intake in broilers was significantly reduced as the guar meal content increased. The results of the present study do

not agree with the findings of Thakur and Pradhan (1975a); Sagar *et al.* (1978), who reported that feed consumption was increased with increased level of guar meal and rations containing raw guar meal were consumed more than rations containing treated guar meal. On ration 'B' (5% guar meal with enzyme) the chicks consumed maximum feed. The results are in line with the results of Khan (1996), who reported that maximum feed was consumed by the chicks fed on ration containing 5% guar meal with enzyme.

The average weight gain of broiler chicks fed on rations A, B, C, D, E, F, G and H were 1817.77, 1813.6, 1648.77, 1169.0, 1796.1, 1723.9, 1538.44 and 1265.9 grams per bird respectively. The highest weight gain was 1817.77 grams on ration A (0% guar meal with

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Table 3: Composition of broiler finisher rations

Ingredients	Rations With Enzyme Supplementation				Rations Without Enzyme Supplementation			
	A (%)	B (%)	C (%)	D (%)	E (%)	F (%)	G (%)	H (%)
Corn	46.40	58.10	61.10	61.20	46.40	58.10	61.10	61.20
Rice Tips	10.00	1.00	1.00	1.00	10.00	1.00	1.00	1.00
Rice Polish	7.20	4.20	1.00	1.00	7.20	4.20	1.00	1.00
Canola Meal	2.20	1.00	1.00	1.00	2.20	1.00	1.00	1.00
Guar Meal	--	5.00	10.00	15.00	--	5.00	10.00	15.00
Sunflower meal	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Corugluten 60%	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Soybean Meal	20.00	16.40	12.00	7.80	20.00	16.40	12.00	7.80
Molasses	5.00	5.00	4.50	3.50	5.00	5.00	4.50	3.50
DCP	1.75	1.76	1.75	1.78	1.75	1.76	1.75	1.78
Limestone	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
L-Lysine	0.28	0.36	0.46	0.53	0.28	0.36	0.46	0.53
D.L. Methionine	0.17	0.18	0.19	0.19	0.17	0.18	0.19	0.19
Premix	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Natugrain (grams in 100 kg)	10.0	10.0	10.0	10.0	-	-	-	-

Table 4: Nutrient profile of finisher rations

Ingredients	A	B	C	D	E	F	G	H
M.E (Kcal/Kg)	2900.00	2900.00	2900.00	2900.00	2900.00	2900.00	2900.00	2900.00
C.P. (%)	19.00	19.00	19.00	19.00	19.00	19.00	19.00	19.00
E.E. (%)	3.39	3.42	3.31	3.54	3.39	3.42	3.31	3.54
C.F. (%)	3.06	3.09	3.27	3.49	3.06	3.09	3.27	3.49
Ca	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Av. P	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
Lysine	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Methionine	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48
Linoleic Acid	1.38	1.53	1.57	1.70	1.38	1.53	1.57	1.70
Price / Kg. (Rs.)	9.69	9.66	9.65	9.61	9.57	9.55	9.54	9.49

enzyme) and the lowest weight gain was 1169.0 grams on ration D (15% guar meal with enzyme). There was non significant ($P>0.05$) difference among different experimental groups as far as enzyme supplementation was concerned. However, highly significant ($P<0.05$) differences were observed in weight gain among the experimental groups on the basis of different levels of guar meal. The results of the present study indicated that the birds consuming lower level of guar meal gained more weight than those consuming higher levels of guar meal. The results are in accordance with the findings of Thakur and Pradhan (1975a); Brahma and Siddiqui (1978); Sagar *et al.* (1978); Verma and McNab (1982); Nagra *et al.* (1985a); Nagra *et al.* (1985b); Patel and McGinnis (1985); Nagra and Virk (1986); Khan (1996); Rajput *et al.* (1998), they all

reported significant decrease in weight gain of broilers consuming higher levels of guar meal. The average feed conversion ratio values for broiler chicks fed on rations A, B, C, D, E, F, G and H were 1.97, 2.0, 2.17, 2.64, 1.99, 2.14, 2.33 and 2.56 per bird respectively. The overall most efficient feed utilization (FCR) was 1.97 in chicks fed on ration A (0% guar meal with enzyme). While least efficient feed utilization was 2.64 by the chicks fed on ration D (15% guar meal with enzyme). There was non significant ($P>0.05$) difference in feed conversion ratio among different experimental groups as far as enzyme supplementation was concerned. However, highly significant ($P<0.05$) differences were observed in feed conversion ratio among the experimental groups on the basis of different levels of guar meal. The results of the present study indicated that as

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Table 5: Mean values of feed consumption, weight gain and fcr at 28th day

Groups	Treatment	Feed consumption (grams)	Weight gain(grams)	FCR
A	0 % guar meal + enzyme	1597.23 ^a	954.37 ^a	1.67 ^a
B	5 % guar meal + enzyme	1706.53 ^a	947.60 ^a	1.80 ^a
C	10 % guar meal + enzyme	1525.60 ^b	820.10 ^b	1.85 ^b
D	15 % guar meal + enzyme	1288.86 ^c	565.63 ^c	2.27 ^c
E	0 % guar meal	1620.66 ^a	929.10 ^a	1.74 ^a
F	5 % guar meal	1573.13 ^a	872.43 ^a	1.80 ^a
G	10 % guar meal	1510.50 ^b	740.57 ^b	2.00 ^b
H	15 % guar meal	1359.73 ^c	634.20 ^c	2.14 ^c

Mean with different superscripts indicate significant difference (P<0.05)

Table 6: Mean values of feed consumption, weight gain, fcr, dressing percentage, mortality percentage and cost per kg live weight gain at 42nd day

Groups	Feed consumption (grams)	Weight gain (grams)	FCR	Dressing Percentage%	Mortality (%)	Cost/kg Live weight gain(Rs.)
A	3631.20 ^{a,c}	1817.77 ^a	1.97 ^a	67.50 ^a	3.33	25.94
B	3797.16 ^{b,a}	1813.60 ^a	2.00 ^a	64.13 ^b	0.00	26.82
C	3601.00 ^c	1648.77 ^b	2.17 ^b	64.07 ^b	0.00	28.27
D	3086.56 ^d	1169.00 ^c	2.64 ^c	61.73 ^c	13.33	35.36
E	3664.33 ^{a,c}	1796.10 ^a	1.99 ^a	66.20 ^a	3.33	26.16
F	3736.20 ^{b,a}	1723.90 ^a	2.14 ^a	63.33 ^b	0.00	27.65
G	3604.93 ^c	1538.44 ^b	2.33 ^b	63.70 ^b	3.33	29.98
H	3254.83 ^d	1265.90 ^c	2.56 ^c	61.33 ^c	6.66	33.69

Mean with different superscripts indicate significant difference (P<0.05)

the level of guar meal increased, there was increase in FCR. The results of the present study are in agreement with the findings of Thakur and Pradhan (1975a); Brahma and Siddiqui (1978), who reported that as the level of guar meal increased FCR also increased.

Average values for dressing percentages of groups A, B, C, D, E, F, G and H were 67.5, 64.13, 64.07, 61.73, 66.20, 63.33, 63.70 and 61.33%, respectively. The highest value for dressing percentage was 67.5% on ration A (0% guar meal with enzyme) and the lowest value was 61.33% on ration H (15% guar meal without enzyme). There was non significant difference (P>0.05) difference in dressing percentage among different experimental groups as far as enzyme supplementation was concerned. However, significant (P<0.05) differences were observed in dressing percentage among the experimental groups on the basis of different levels of guar meal. The results indicated that with the increase of guar meal the dressing percentage was decreased. The findings of the present study co-relate with the findings of Thakur and Pradhan (1975b),

who reported that dressed weight decreases with increasing level of guar meal.

Mortality due to pasting was recorded in groups D, G and H, number of birds died on these groups were 4, 1 and 2 mortality percentage in these groups was 13.33, 3.33 and 6.66%, respectively. One bird died in group A and E due to early chick mortality. The results of mortality indicated that significant mortality occurred at 15% guar meal level. The results of this study are in agreement with the findings of Thakur and Pradhan (1975a), Thakur and Pradhan (1975b) and Sagar *et al.* (1978), who reported that the mortality rate has an increasing trend at 15% guar meal in diets.

Cost per kg live weight gain For groups A, B, C, D, E, F, G and H was Rs. 25.94, 26.82, 28.27, 35.36, 26.16, 27.65, 29.98 and 33.69, respectively. The results indicated that as the level of guar meal increased in the ration the price decreases but at the same time cost per kg of live weight increased. Enzyme supplementation of the rations decreases the cost per kg of live weight gain. The results are in accordance with the findings of Swain and

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Johri (1999); Al-Homidan *et al.* (2000), they reported that cost per kg of live weight decreases with the addition of enzyme and enzyme supplementation gave an economic return, but on ration 'D' (15% guar meal with enzyme) cost per kg of live weight gain was more than its counterpart.

The result of the present study indicated that there was non significant differences in weight gain, feed consumption and FCR among the chicks fed on rations containing 0 and 5% guar meal, but at 10% or above level of guar meal adverse effects were seen, so guar meal could be used below 10% in broiler rations without any adverse effect.

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