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Effect of Different Levels of Maize Gluten Meal (60%) on the Growth Performance of Broiler Chicks

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Abstract: Studied the effect of different levels of maize gluten meal (60%) on the growth performance of broiler at Sindh Agriculture University Tandojam during October-November, 1999. 300 chicks were divided in six groups, Group A (control), while Groups B, C, D, E and F were given 3%, 6%, 9%, 12% and 15% maize gluten meal respectively. It was observed that highest maize gluten meal MGM levels of 12% (E) and 15% (F) did not show positive effect on any of the quantitative and qualitative characters and group D (9% MGM) was considered as an optimum MGM level for obtaining economical and profitable results. Group D (9% MGM) consumed relatively less quantity of feed (4246.51 g) per bird and produced significantly higher weight gain (2063.50) g, feed conversion ratio (2.05), dressing percentage (68.95), liver weight (51.39) g, gizzard weight (31.27) g and heart weight (10.81) g. No mortality was recorded in group 'D' and hence was most economical by offering Rs. 26.34/bird net profit as compared to Rs. 23.33, 22.99, 22.36, 12.49 and 11.03/bird net profit in groups F, E, C, B and A, respectively. It was concluded that maize gluten meal (MGM) is a valuable ingredient for broiler ration including 9% MGM proved to be an efficient feed ingredient for optimum broiler growth. Further increase in MGM ingredient did not show any positive effect on production and profitable broiler farming.

Key words: Level of Maize, Performance, Broiler chicks

Introduction

Poultry farming offers the best prospects for rapid increase in the production of high quality protein in the form of eggs and meat (Akram, 2000). During past decade the poultry production has enjoyed a tremendous scope on commercial scale. At present, the population of day old chicks is 350.5 million, 19.9 million layers, 227.2 million broiler and 6.5 million breeding stocks. In rural poultry, the population of day old chicks is 33.5 million, 9.4 million cocks and 33.6 million layers. Both the commercial and rural poultry produced 370 thousand tonnes meat and 7860 million eggs during 2002-2003 (Economic Survey of Pakistan, 2003).

The standard daily per capita requirement of total protein is 68.3 g, out of which 27.4 g should be of animal origin; while at present in Pakistan per capita consumption of animal protein is 17.4 g (Bhatti, 2001). To overcome gap, poultry industry can play its role by providing the best source of palatable, nutritious and high quality animal protein in a comparatively short duration at an appropriate and affordable cost. Vegetable protein sources are available in comparatively greater quantities and can efficiently be incorporated in poultry rations, if their optimum levels are established. The vegetable protein sources are commonly available in the forms of cakes/meal as by products from oilseed produce. Among vegetable protein sources, guar meal is being exported whereas, soybean meal is being imported, therefore, is also expensive in the market. The remaining sources, like cottonseed meal, sunflower meal and rapeseed meal are being used in the poultry diets with a caution due to presence of anti-nutritional factors in these ingredients (Anonymous, 1995). Poultry is the most efficient converter of inedible proteins into edible. It converts 2.5 lbs of feed in to one lb of chicken and 2.46 lbs of feed into one lb of egg. Chicken food consist of cereals (coarse grains), plant protein source, animal protein source, agro-based industrial by-products, vitamins, minerals, antibiotics, maize, sorghum, broken rice, fish meal, meat meal, blood meal, decorticated cotton seed meal, til cake, toria cake, guar meal, ground-nut cake, sun flower cake and soybean meal and maize gluten meal (Farzana Panhwar, 2004).

Among complex feed ingredients maize gluten meal keeps sufficient essentiality in feed composition. It is a part of the maize *Zea mays* that remains after large position of starch, germ and bran is removed from in the manufacture of maize (corn) syrup and maize starch. Due to the development of the corn development industry in the country maize gluten meal is abundantly available at reasonable rates. Maize gluten meal is a rich source of protein, vitamin A, Lucine and isoleucine. Keeping in view the importance and vitality of maize gluten meal in broiler feed, the present study was therefore, carried out to determine the effect of different levels of maize gluten meal (60%) on the growth performance and economical production of broiler.

Materials and Methods

Three hundred (300) Hubbard broiler chicks were purchased and were initially weighed. For accommodating the flock of the day-old-chicks, a shed was prepared hygienically. Birds were divided as per the randomized design into six groups A, B, C, D, E and F having 50 chicks in each group. All groups were provided with rations having varying levels of maize gluten meal (60%). Group A was kept as control and was given 0% maize gluten meal. Groups B, C, D, E and F were given 3%, 6%, 9%, 12% and 15% maize gluten meal, respectively. The chicks were fed *ad libitum* with starter and finisher ration throughout the period ranging 0-6 weeks of experiment. From 0-4 weeks starter ration and 5-6 weeks finisher ration was given (Table 2 and Table 3). Saw dust was used as litter and paper was used to cover the litter and comfort the chicks during first. Humidity was maintained at 60%, while temperature at 90-95 °F during first week, later on reduced gradually till 70°F (room temperature) and light was given 24 hours. The data on feed consumption were recorded for all the boilers in each group on daily and weekly basis, while for other parameters, 5 birds were randomly selected from each group at the completion of trial and slaughtered for the recording of dressed weight, dressing percentage and weight of internal organs i.e. liver, heart and Gizzard. The data thus collected were tabulated and subjected to statistically analysed by using MSTATC Computer Software in General Linear Model, while the comparison within treatments was made by using L.S.D. (Least Significant Difference) test following Gomez and Gomez (1984).

Results and Discussion

Feed Consumption: Feed consumption (Table 1) of broilers was significantly (P<0.05) affected due to supplementation of maize gluten meal (MGM) to varied proportions. The average feed consumption was 4379.59, 4313.17, 4340.27, 4246.51, 4372.89 and 4361.31 g in groups A, B, C, D, E and F, respectively. It is obvious from the results that 9% MGM proved to be an optimum proportion for feed composition, because it resulted in decreased feed intake and increased weight gain as compared to lower or higher MGM proportions.

Table 1: Mean values for parameters of economic importance of broiler as influenced by maize gluten meal (60%) at different levels

Groups (MGM levels)	Feed concumption (g)	Weight gain (g)	FCR	Dressing % weight	Liver weight (g)	Heart weight (g)	Gizzard (%) (g)	Mortality	Net profit Rs/bird
A= 0 (control)	4379.59	1760.52	2.48	65.84	51.27	10.68	31.03	4.00	11.03
B= 3 %	4313.17	1777.67	2.42	66.33	51.00	10.86	31.00	0.00	12.49
C= 6%	4340.27	1998.64	2.17	67.73	51.11	10.96	31.22	0.00	22.36
D= 9%	4246.51	2063.50	2.05	68.95	51.39	10.81	31.27	0.00	26.34
E= 12%	4372.89	2019.75	2.16	64.37	51.70	10.77	31.24	0.00	22.99
F= 15%	4361.31	2024.50	2.15	63.78	50.98	10.68	31.18	2.00	23.33
S.E.±	41.436	95.8520	0.0848	0.2734	0.2922	0.3065	0.1203	-	-
LSD 0.05	90.80	220.00	0.1855	0.8645	NS	NS	NS	-	-
LSD 0.01	120.80	279.30	0.2467	1.164	NS	NS	NS	-	-
Prob.	0.050	0.001	0.001	0.001	0.1996	0.1310	0.1196	-	-

Table 2: Composition of Starter Ration (%)

Ingredients	Groups					
	A	B	C	D	E	F
Rice broken	30.0	25.0	30.0	30.0	30.0	30.0
Rice Polish	2.0	3.0	2.0	3.0	4.0	4.5
Fish meal 45%	15.0	13.0	8.5	6.0	3.0	-
Soybean meal	10.0	8.5	9.0	8.0	8.0	7.5
Canola meal	5.0	5.0	5.0	4.5	5.5	6.0
Wheat	10.0	10.0	10.0	10.0	10.0	10.0
Corn gluten meal 30%	5.0	5.0	5.0	5.0	3.0	2.5
Corn gluten meal 60%	0.0	3.0	6.0	9.0	12.0	15.0
Bone meal	-	-	-	1.0	1.0	1.5
Maize	10.0	15.0	10.0	10.0	10.0	10.0
Lime Stone	-	1.0	1.5	1.5	1.5	2.0
Molasses	4.0	3.0	4.0	3.0	4.0	4.0
Guar meal	5.5	5.0	5.0	5.5	4.5	4.5
Sunflower meal	3.5	3.5	4.0	3.5	3.5	2.5
Total	100	100	100	100	100	100
Chemical Composition (%)						
Crude Protein	22	22	22	22	22	22
M.E. (Kcal/kg)	2940	2900	2900	2912	2920	2940
Calcium	1.05	1.05	1.05	1.05	1.05	1.05
Phosphorus	0.56	0.56	0.56	0.56	0.56	0.56
Crude fibers	3.1	3.1	3.1	3.1	3.1	3.1

Further increase in MGM caused increase in feed consumption due to increased feed palatability but no positive effects on weight gain of broilers. The results of the present investigation are partially supported by the findings of Chamruspollert *et al.* (2002), who were also of the experience that MGM supplementation to a certain level caused decrease in feed consumption and improved the carcass quality and quantity.

Weight Gain: Weight gain (Table 1) of broilers was significantly (P<0.01) affected due to supplementation of MGM at different levels. The weight gain was 1760.52, 1777.67, 1998.64, 2063.50, 2019.75 and 2024.50 g in groups A, B, C, D, E and F, respectively. Maximum weight gain (2063.50 g) was recorded in broiler fed on ration contained 9% MGM, followed by birds in group F and group E. The birds fed on ration contained 9% MGM showed optimum performance with significantly maximum weight gain as compared to rest of the treatments or control. The increase in MGM beyond 9% resulted no beneficial effect on weight gain even adverse effects were observed and weight gain was reduced a little with increasing MGM supplementation in ration. Similar results have also been reported by Waldroup (2000), Chamruspollert *et al.* (2002), experienced improved carcass quality and quantity with MGM supplementation in broiler ration to a certain level. Furthermore, Rose *et al.* (2003) concluded that MGM in the diet of broiler had great effect on their fat carcass.

Table 3: Composition of Finisher Ration (%)

Ingredients	Groups					
	A	B	C	D	E	F
Rice broken	55.0	57.0	56.0	57.0	56.0	57.0
Rice Polish	3.5	2.5	3.5	3.0	2.5	3.5
Fish Meal 45%	12.0	10.0	7.5	5.5	3.5	-
Soybean Meal	4.5	3.5	3.0	3.0	3.0	3.5
Canola Meal	5.0	3.0	4.0	3.0	3.5	3.0
Cotton Seed Meal	3.0	3.5	4.0	3.5	4.0	4.0
Corn gluten meal 30%	2.0	2.5	2.0	2.0	1.5	2.0
Corn gluten meal 60%	0.0	3.0	6.0	9.0	12.0	15.0
APC 45%	4.5	3.0	2.5	2.5	2.0	-
Sunflower meal	3.0	3.0	2.0	2.0	1.5	2.0
Lime Stone	-	-	0.5	1.0	1.0	1.0
Molasses	2.0	3.0	3.0	2.0	3.0	3.0
Bone meal	-	0.5	1.0	1.0	1.5	2.0
Guar meal	5.5	5.5	5.0	5.5	5.0	4.0
Total	100	100	100	100	100	100
Chemical Composition (%)						
Crude Protein	20	20	20	20	20	20
M.E. (Kcal/kg)	3100	3150	3150	3160	3170	3195
Calcium	1.05	1.05	1.05	1.05	1.05	1.05
Phosphorus	0.56	0.56	0.56	0.56	0.56	0.56
Crude fibers	3.1	3.1	3.1	3.1	3.1	3.1

Feed Conversion Ratio: Feed conversion ratio (Table 1) was significantly ($P<0.01$) affected due to supplementation of MGM at increasing levels. The average feed conversion ratio was 2.48, 2.42, 2.17, 2.05, 2.16 and 2.15 in groups A, B, C, D, E and F, respectively. Remarkably efficient feed conversion ratio (2.05) was recorded in broiler fed on ration contained 9% MGM, followed by birds in group F and group E. The broiler fed on ration contained 9% MGM recorded maximum feed efficiency with significantly better feed conversion ratio as compared to rest of the treatments or control. The increase in MGM over 9% had no economical effect on feed conversion ratio even feed conversion ratio was reduced with increasing MGM supplementation. These results are in agreement with those of Silva *et al.* (2003) who observed positive effect of MGM supplementation and reported that feed efficiency improved significantly with increasing MGM to a certain proportion. Furthermore, Koreleski (2003) characterized higher weight gain and feed efficiency in broilers fed on ration contained higher MGM.

Dressing percentage: Dressing percentage (Table 1) of broilers was significantly ($P<0.01$) affected due to supplementation of MGM at increasing levels. The average dressing percentage was 65.84, 66.33, 67.73, 68.95, 64.37 and 63.78 percent in groups A, B, C, D, E and F, respectively. Significantly higher dressing percentage (68.95%) was observed in case of broilers fed on ration contained 9% MGM, while the birds in group C and group B ranked second and third. Broiler fed on ration contained 9% MGM showed its superiority in dressing percentage which was mainly associated with better weight gain and feed conversion ratio. The increase in MGM over beyond 9% proved to be uneconomical because the dressing percentage was adversely affected in broilers fed on ration contained MGM more than 9%. Rose et al have also reported well comparable results. Who supplemented varied MGM levels in broiler ration and found improved carcass fat which ultimately improved the dressing percentage, and MGM provided higher lysine percentage which influence the composition of carcass and fat metabolism.

Weight of Giblets: Weight of giblets (Table-1) was not significantly affected ($P>0.05$) due to increasing levels of MGM. Average liver weight was 51.27, 51.00, 51.11, 51.39, 51.70 and 50.98 g, gizzard weight 31.03, 31.00, 31.22, 31.27, 31.24 and 31.18 g and heart weight was 10.68, 10.86, 10.96, 10.81, 10.77 and 10.68 g, in groups A, B, C, D, E and F, respectively. These results have been fully supported by earlier workers like Silva *et al.* (2003) who were of the experience that broiler fed on ration contained increased proportions of MGM did not affect the weight of internal organs and Yu *et al.* (2002) observed no significant effect on the internal organs of broilers fed on rations containing increasing levels of MGM.

Mortality: There was no effect of MGM in increasing proportions on the mortality of broilers, which shows that MGM is a safer supplement for broiler ration so far the mortality is concerned. These results have been fully supported by earlier workers like Christensen *et al.* (1995) and Silva *et al.* (2003) who were of the experience that broiler fed on ration contained increased proportions of MGM had no effect on mortality rate of broilers.

Economics: The cost of feed was Rs.45.95, 45.28, 45.57, 44.58, 45.91 and 45.79 in groups A, B, C, D, E and F, respectively; while the total cost per chick was Rs. 69.95, 69.28, 69.57, 68.58, 69.92 and 69.79 in groups A, B, C, D, E and F, respectively. Against above production cost per chick, the total income per chick achieved was Rs. 80.98, 81.77, 91.93, 94.92, 92.90 and 93.12 in groups A, B, C, D, E and F, respectively. Thus, the net profit per bird received was Rs. 11.03, 12.49, 22.36, 26.34, 22.99 and 23.33, in groups A, B, C, D, E and F, respectively. So, in this investigation group D (9% MGM) proved to be most economical and profitable for broiler production.

Conclusions

After detailed scrutiny of the results, it was concluded that ration containing 22% CP and 2912 Kcal/kg in starter ration and 20% CP and 3160 Kcal/kg in finisher ration including 9% of MGM for broiler ration proved to be an efficient feed ingredient for optimum broiler growth, FCR and better net returns. Further increase in MGM ingredient did not show any positive effect on production and profitable broiler farming.

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