

Original Research Article

Effect of varying levels of probiotic (Toyocerin®) on the performance of broiler chicks

Abstract

The experiment was conducted to investigate the effect of varying levels of probiotic (Toyocerin®) on the performance of broiler chicks in a completely randomized design. One hundred and fifty broiler chicks were divided into five experimental groups (three replicates of ten chicks each). Broiler chicks were raised for 42 days. Five isocaloric and isonitrogenous broiler starter diets containing 20% crude protein and 2780 Kcal/kg ME were formulated and fed from day 8 to 28. Similarly, five isocaloric and isonitrogenous broiler finisher diets containing 18% crude protein and 2880 Kcal/kg ME were fed from day 29 to 42. Toyocerin® was added at the level of 0, 25, 50, 75 and 100 g/100 Kg of diet and denoted as T₁, T₂, T₃, T₄ and T₅ respectively. Whereas, T₁ was treated as a control group. Weekly body weight gain, feed consumption and feed conversion ratio were recorded. At the end of trial, two birds per replicate were slaughtered randomly for the determination of carcass traits. The addition of Toyocerin® in the diet of broilers (8-42 day) significantly improved the body weight gain, feed intake, feed conversion ratio, dressing percentage, breast meat yield and liver weight as compared to control group. The findings revealed that addition of Toyocerin® improved birds' performance and carcass traits.

Introduction

Poultry farming is now considered to be one of the most integral and dynamic component of the worldwide meat production. Commercial poultry production is ranked one of the best sources of animal protein in the world. Poultry industry in Pakistan flourished incredibly over the

last four decades. This fast growth has helped to meet the protein demand in human diet and maintain stability of protein source in the country. Broiler production is the fastest way to get the high quality animal protein in shortest possible time. The ideal broiler rearing for maximum weight gain relies on the strain of bird, feed quality and management practices. In addition; early chick mortality, stress and disease outbreaks are key factors which lead to low growth rate in broilers.

Feed costs up to 70 percent of production cost and is an integral component of a poultry farm budget (Esonu et al., 2006). Therefore, quality and quantity of feed plays a pivotal role in making the feasibility of poultry sector. Better feed conversion ratio, which can lead to efficient growth rate in broiler production, finally leads to higher profit. Therefore, there is a need to improve the poultry feed quality by adding certain feed additives in it.

Feed additives are the non-nutritive substances added in feed to improve its acceptance and efficiency of utilization, or to be contributive to health and metabolism of birds (Khan, 2001). These may be classified as probiotics, antibiotics, antifungals, antioxidants, emulsifiers, ionophores, pellet binders, stabilizers, flavoring agents, plant extracts, certain drugs and hormones. Among various feed additives, probiotics are in use for last three decades. Probiotics are live microorganisms and when added in the diet/ water in adequate amount, result in health benefit of the host. A number of probiotics are available in the market with the claim that these stimulate growth, improve health and performance of birds.

In Pakistan, little work has been done on the evaluation of some commercially available feed additive probiotics on the performance of broiler chicks. The advancement in poultry nutrition and introduction of new products in the market invite the researchers to explore the

efficiency of new available growth promoters and to compare their efficacy with the already existing in the market. This kind of an innovative research might be helpful in sustaining the meat prices in the years ahead. The following study was planned to check the effect of addition of different levels of Toyocerin[®] (*Bacillus toyoi*) on feed intake, weight gain, feed conversion efficiency and carcass traits in broiler chicks.

Materials and Methods

The experiment was conducted at Raja Muhammad Akram Animal Nutrition Research Center, Institute of Animal Nutrition and Feed Technology, University of Agriculture, Faisalabad, Pakistan to study the effect of varying levels of probiotic (Toyocerin[®]) on the performance of broiler chicks.

The broiler house was white-washed and disinfected with formalin before the arrival of chicks. The chicks were housed and raised under standard managerial conditions. The temperature was maintained at 95°F for first week and then it was lowered down by 5°F each week till it reached 75°F. Fresh water and light were made available round the clock during the experimental period.

One hundred and fifty broiler chicks were divided into five experimental groups (T₁, T₂, T₃, T₄ and T₅), three replicates of ten chicks each. Chicks were fed ground maize for first three days and then commercial diet was fed. Five iso-nitrogenous (20% CP), and iso-caloric (2780 Kcal/kg) broiler starter diets were formulated and fed from day 8 to 28. In the same way an iso-nitrogenous (18% CP) and iso-caloric (2880 Kcal/kg) broiler finisher diets were formulated and were fed from day 29 to 42. Toyocerin[®] was added at the level of 0, 25, 50, 75 and 100 g/100 Kg of diet and denoted as T₁, T₂, T₃, T₄ and T₅ respectively. Whereas, T₁ was treated as a control group. The birds were fed *ad-libitum* throughout the experiment.

Weekly body weight gain, feed consumption and feed conversion ratio were recorded. At the end of trial, two birds per replicate were picked up randomly and were slaughtered in order to get data on dressing percentage, breast meat yield, thigh meat yield and giblet organs weights. Proximate analysis of diets (broiler starter (Table 1) and finisher (Table 2)) for dry matter, crude protein, ether extract, crude fiber and crude ash were analyzed according to standard procedure (AOAC, 1994).

The data recorded were subjected to statistical analysis using analysis of variance technique under completely randomized design and in case of significant differences among treatments, means were determined by applying Duncan's Multiple Range test (Steel *et al.*, 1997).

Results

During starter phase, feed consumption was significantly higher for T₃ and T₂ groups while birds of T₄ group consumed less feed. During finisher phase, feed consumption was significantly higher for T₂ group as compared to all other groups (Table 3). Average feed intake was recorded lowest in T₁ and T₄ groups. However, it was significantly higher in birds of T₂ and T₃ groups.

Addition of Toyocerin in T₄ and T₅ groups significantly increased the average body weight gain in starter phase. During finisher phase, body weight gain showed significant increase in weight gain in T₂ group as compared to other groups. Overall, a non-significant difference was observed among various treatments (Table 3).

Significant improvement in feed conversion ratio was observed by the addition of Toyocerin in T₄ group as compared to other groups. Feed conversion ratio showed that birds of

group T₄ achieved significantly better feed conversion ratio as compared to all other experimental groups (Table 3).

Dressing percentage was significantly higher in T₄ group as compared to other groups. Whereas, minimum dressing percentage was observed in those birds fed control diet. Supplementation of Toyocerin had significant affect on breast meat yield and liver weight. However, non-significant difference on thigh meat yield, heart weight and gizzard weight were found in birds fed diets containing varying levels of Toyocerin (Table 4).

Discussion

The results of present research are supported by the findings of Ashayerizadeh *et al.* (2011) who found that addition of probiotic (Primalac) at the level of 90 g/100 kg of diet significantly improved body weight gain of chicken. Armut and Filazi (2012) also reported that supplementation of probiotic in the diet of broiler chicks improved the average body weight gain when fed at 50 g/100 kg of diet. Dalia *et al.* (2012) described that addition of yeast (*Saccharomyces cerevisiae*) at 3% of diet significantly increased the average weight gain of Japanese quails. Similar results were found by Paryad and Mahmoudi (2008) who reported that inclusion of 1.5% yeast (*Saccharomyces cerevisiae*) in broiler ration significantly improved the body weight gain. The findings of research are also in accordance with Mutassim (2013) who found that addition of yeast culture at 3kg/ ton of feed significantly increased the average body weight gain of broiler birds.

The results of Guclu (2011) are also in accordance with our findings who reported that addition of mixed probiotic (containg both bacterial and yeast species) in the diet of quail improved average feed intake when fed at 50 g/100 kg and 100 g/100 kg of diet. Similarly,

Kaseem and Rabie (2012) found that addition of live yeast (Thepax[®]) at 50 g/100 kg of diet and 100 g/100 kg of diet significantly improved the average feed intake values. Mutassim (2013) also reported that addition of yeast culture at 3 kg/t of diet improved the average feed intake in broiler chickens. However, the present results do not support the findings of Ghally and Latif (2007) that added yeast culture (containing *Saccharomyces cerevisiae*) at 1% or 2% of diet and found no effect on feed consumption in Japanese quails. The results are also contradictory to the findings of Nagharchi *et al.* (2009) who added various probiotic bacteria at 0.25% of diet and did not show significant effect on average feed intake values of broiler chicks.

The results are in agreement with the findings of Ramesh *et al.* (2000) who observed that chicks fed probiotic cultures showed better feed conversion ratio than control chicks. Saadia and Nagla (2010) supplemented live yeast (Prolex[®]) containing *Saccharomyces cerevisiae* at varying dietary levels (0.0%, 0.4%, 0.8%, 1.2% and 1.6%) and found that 0.4 % and 0.8% dietary levels showed improved FCR. Mutassim (2013) observed that addition of yeast culture at 3 kg/t of diet improved the feed conversion efficiency in broiler chickens.

Our findings were supported by Khan (2001) who observed improved dressing percentage in broilers fed distillery yeast sludge. Paryad and Mahmoudi (2008) also reported similar findings. Similarly, other researchers (Penkov *et al.*, 2004; Dimcho *et al.*, 2005) found significant effect on liver weight with probiotic supplementation in the diet. Contrary to this, Sharif *et al.* (2012) reported that supplementation of yeast in the diet resulted in decreased average heart, liver and pancreas weights.

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180 **Table 1: Inclusion rate of ingredients and percent Nutrient composition of broiler starter**
 181 **diets**

Ingredients	Diets				
	T1	T2	T3	T4	T5
Maize	37.57	37.57	37.57	37.57	37.57
Rice broken	15.21	15.21	15.21	15.21	15.21
Rice polishing	9.63	9.63	9.63	9.63	9.63
Canola meal	9	9	9	9	9
Corn gluten 60%	5.4	5.4	5.4	5.4	5.4
Soybean meal	15.45	15.45	15.45	15.45	15.45
Fish meal	2.51	2.51	2.51	2.51	2.51
Limestone	1.09	1.09	1.09	1.09	1.09
Di-calcium phosphate	1.4	1.4	1.4	1.4	1.4
Molasses	2	2	2	2	2
L-Lysine	0.14	0.14	0.14	0.14	0.14
Vit. Min. Premix	0.6	0.6	0.6	0.6	0.6
Total	100	100	100	100	100
Toyocerin (g/100 kg diet)	0	25	50	75	100
Nutrient Composition					
CP (%)	20	20	20	20	20
ME (Kcal/kg)	2780	2780	2780	2780	2780
CP:ME (Kcal/kg)	1:139	1:139	1:139	1:139	1:139
CF (%)	4.74	4.74	4.74	4.74	4.74

Lysine (%)	1.03	1.03	1.03	1.03	1.03
Methionine (%)	0.5	0.5	0.5	0.5	0.5
Ca (%)	1	1	1	1	1
Av. P (%)	0.45	0.45	0.45	0.45	0.45

Table 2: Inclusion rate of ingredients and percent Nutrient composition of broiler finisher diets

Ingredients	Diets				
	T1	T2	T3	T4	T5
Maize	45.25	45.25	45.25	45.25	45.25
Rice broken	11.9	11.9	11.9	11.9	11.9
Rice polishing	11	11	11	11	11
Canola meal	4	4	4	4	4
Corn gluten 60%	5.4	5.4	5.4	5.4	5.4
Soybean meal	14	14	14	14	14
Fish meal	2	2	2	2	2
Limestone	1.3	1.3	1.3	1.3	1.3
Di-calcium phosphate	1.2	1.2	1.6	1.2	1.2
Molasses	3	3	3	3	3
L-Lysine	0.25	0.25	0.25	0.25	0.25
Vit. Min. Premix	0.7	0.7	0.7	0.7	0.7
Total	100	100	100	100	100
Toyocerin (g/100 kg diet)	0	25	50	75	100
Nutrient Composition					
CP (%)	18	18	18	18	18
ME (Kcal/kg)	2880	2880	2880	2880	2880
CP:ME (Kcal/kg)	1:160	1:160	1:160	1:160	1:160
CF (%)	4.43	4.43	4.43	4.43	4.43

Lysine (%)	0.9	0.9	0.9	0.9	0.9
Methionine (%)	0.4	0.4	0.4	0.4	0.4
Ca (%)	0.9	0.9	0.9	0.9	0.9
Av. P (%)	0.35	0.35	0.35	0.35	0.35

Table 3: Average values of body weight gain, feed intake and feed conversion ratio per broiler chick fed diets containing varying levels of Toyocerin

Parameters	T1	T2	T3	T4	T5
Weight gain (g) (8-28 days)	813.2 ^b	808.7 ^b	813.4 ^b	844.4 ^a	829.4 ^{ab}
Feed intake (g) (8-28 days)	1396.3 ^{ab}	1414.9 ^{ab}	1434.5 ^a	1379.6 ^b	1409.2 ^{ab}
Feed conversion ratio (8-28 days)	1.71 ^{ab}	1.76 ^a	1.76 ^{ab}	1.63 ^c	1.69 ^{bc}
Weight gain (g) (29-42 days)	542.1 ^{ab}	563.2 ^a	542.9 ^{ab}	530.8 ^b	527.5 ^b
Feed intake (g) (29-42 days)	868.6 ^b	913.5 ^a	876.4 ^b	867.7 ^b	871.6 ^b
Feed conversion ratio (29-42 days)	1.6 ^c	1.62 ^b	1.61 ^{bc}	1.63 ^{ab}	1.65 ^a
Weight gain (g) (8-42 days)	1355.4 ^a	1372.1 ^a	1356.3 ^a	1375.3 ^a	1356.9 ^a
Feed intake (g) (8-42 days)	2264.8 ^{bc}	2328.4 ^a	2310.9 ^{ab}	2247.3 ^c	2277.5 ^{abc}
Feed conversion ratio (8-42 days)	1.67 ^{ab}	1.69 ^a	1.7 ^a	1.63 ^b	1.68 ^a

Values having same super-scripts show non-significant difference.

191 **Table 4: Average values of dressing percentage, breast meat, thigh meat and giblet organs**
 192 **(liver, heart and gizzard) (g/100g body weight)**

Parameters	T1	T2	T3	T4	T5
Dressing percentage	63.11 ^b	64.4 ^{ab}	64.83 ^{ab}	66.15 ^a	64.9 ^{ab}
Breast meat yield	19.5 ^c	21.48 ^b	21.83 ^{ab}	23.26 ^a	21.52 ^b
Thigh meat yield	6.59	6.86	7.58	7.15	7.75
Liver weight	2.34 ^{ab}	2.42 ^a	2.3 ^{ab}	2.37 ^{ab}	2.24 ^b
Heart weight	0.47	0.51	0.5	0.47	0.48
Gizzard weight	2.35	2.17	2.31	2.12	2.22

193 Values having same super-scripts show non-significant difference.

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