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Effect of salbutamol (a beta-adrenergic agonist) on growth performance of broiler chickens

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ABSTRACT

This study was conducted to evaluate the effect of salbutamol (beta-adrenergic agonist) on performance in male broiler chickens. A total of 420 (Cobb-500) day-old male broiler chickens were randomly assigned to 7 treatments each in 4 replicates of 15 birds per pen. Treatments include: control, 5, 10 and 15 mg salbutamol per liter water and 10, 20 and 30 mg salbutamol per kg diet. The experiments designed for 6 weeks. Results from this experiment indicated that feed intake at 1-42 days was reduced by 10, 20 and 30 mg/kg salbutamol compared with the control group ($p<0.0001$). Body weight gain and final body weight were reduced by 10 and 20 mg/kg salbutamol compared with the other treatments ($p<0.0001$). The feed conversion ratio was significantly affected by 10 mg/kg salbutamol compared with the control group ($p<0.05$). In conclusion, it seems that feeding salbutamol as a beta-adrenergic agonist, can improve growth performance in broiler chickens.

Key words: beta-adrenergic agonist, salbutamol, broiler chicken, feed conversion ratio.

INTRODUCTION

As early as 1963, there were reports on the effects of β-adrenergic agents on growth performance and carcass composition of chickens. Daily subcutaneous injection of epinephrine produced some stimulation of weight gain in Leghorns and broilers. The response was more pronounced in males than in females, and the response was observed to decrease as the dose increased [36]. The use of the beta agonists from growth promotion in food-producing animals is not approved within the European Community, the United States, and most other countries. The illegal use of these compounds for cattle has already led to several cases of intoxication in humans after consumption of contaminated animal liver [19-18]. The possibility of illegal use of such

compounds in broiler production and the lack of data on residues have underlined the need to generate information on the tissue distribution and tissue residues after withdrawal of beta-agonists in this species. In addition, small animals facilitate the use of a significant number of animals in a comparison of compounds and several withdrawal times. Methods for the purification and detection of clenbuterol [11-23], salbutamol [4-14] and cimaterol [8] in animal tissues are now available. The positive effects of beta adrenergic agonists on performance and repartitioning in meat producing animals, including poultry, are well documented by several researchers [24-34-36] . Despite these positive effects, interest in the use of beta agonists in meat producing animals retarded in the early nineties following outbreaks of allergic reactions attributed to consumption of livers from cattle treated with clenbuterol and a subsequent ban placed on their use by the European Union [20]. Various beta-adrenergic agonists have been shown to be capable of improving weight gain when added to the feed of various domestic species [1-3-16-17-26-30-32-35]. In other hand, increasing carcass weight without increasing feed intake are well documented in meat producing animals [34-36] while the exact mechanism of action of these compounds remained unknown. A previous study reported that clenbuterol, cause to marked decrease in body weight gain and food intake in broiler chickens fed on a low protein diet [13]. Kim *et al.* [15] showed that the higher growth response to cimaterol in broilers occurred when the dietary protein and energy were higher than normal. However, it is unclear whether the dietary protein content is an important factor in the improvement in, and maintenance of, the performance in response to dietary beta-agonist supplementation for broilers [36]. Various b-adrenergic agonists have been shown to be capable of improving weight gain when added to the feed of various domestic species [1-3-16-17-26-30-32-35]. The growth promoting effects of these compounds might decrease with time and that administration of the compounds to birds later in the growth might be more beneficial. Almost all studies with β agonists have been conducted with administration of the compounds occurring in the grower-finisher periods for the various species [2]. The variation in responses may be due to the different mechanisms of action of the various beta-adrenergic agonists in various species [22]. Dalrymple et al, [6] reported a significant increase in slaughter weight of broilers (sexes mixed) fed clenbuterol up to 1 ppm from 28 to 49 days of age. In several experiments concerning cimaterol supplementation to broiler chicks summarized by Dalrymple et al [7]. a consistent increase in weight gain was observed. Although the beta-adrenergic agonist L340, L333 was found to increase weight gain of broilers [9-25], Merkly and Cartright [21] did not observed any effect of 0.25 ppm cimaterol on weight gain of broilers. Because the growth-promoting effect of beta-adrenergic agonists is likely to be dependent on type, dosage, and possibly also on strain of broilers, those factors may account for the apparent discrepancies among published studies. Also previous study reported that a beta-agonist, clenbuterol, brought about a marked decrease in body weight gain and food intake in broiler chickens fed on a low protein diet [13]. The aim of this study was to investigate effects of feeding salbutamol on production performance of male broiler chickens.

MATERIALS AND METHODS

A study was conducted in the Poultry Research Unit of Islamic Azad University, Shabestar Branch (1500m altitude), Shbaestar, Iran, at the winter (2011). A total of 420 one-d-old male broilers chicks (Cobb 500) were used for the study. One-day-old broiler chickens were randomly assigned to 7 treatments each in 4 replicates of 15 birds per pen. Treatments include: T0: control,

T1: 5 mg salbutamol per liter water, T2: 10 mg salbutamol per liter water, T3: 15 mg salbutamol per liter water, T4: 10 mg salbutamol per kg diet, T5: 20 mg salbutamol per kg diet and T6: 30 mg salbutamol per kg diet. From days 21 to 42 of the rearing, salbutamol was added to fed (mixed in finisher diet) or water. The birds were reared until 42 d of age, and the house temperature was controlled until the sixth week by thermostatically controlled brooders starting at 32°C and gradually decreased by 2°C per week. After the sixth week, and until the end of the experiment, the average maximum and minimum of temperature inside the house was 21 and 15°C for experiments. The experiment was consisted of starter (1-21 days) and finisher (22-42 days) periods according to the NRC [28]. A corn-soybean meal diet was formulated to meet NRC [28] nutrient recommendations for each period (Table 1).

Water was provided *ad libitum*, and incandescent light was used to provide 23 h of light and 1 h darkness throughout the experimental period. The variables considered at the end of each experiment were body weight gain, feed conversion, and feed intake. Live BW and feed consumption were recorded manually weekly and the average of the whole group from each experimental unit at the beginning, before and after restriction, and at the end of each experiment to estimate weight gain and feed conversion. All the collected data were analyzed through the SAS [33] software.

Table 1: Composition of experimental diets (%)

Ingredients	Starter (1-21)	Grower (22-42)
Yellow corn	**56.9**	**63**
Soybean meal	**33.5**	**28.17**
Corn gluten	**2.9**	**1.77**
Inert	**0**	**0.4**
Oyster shell	**1.1**	**1.1**
Dicalcium phosphate	**2**	**1.7**
Salt	**0.3**	**0.3**
Vitamin/mineral premix[1]	**0.5**	**0.5**
DL-Methionine	**0.1**	**0.03**
L-Lysine	**0.0**	**0.03**
Animal fat	**2.65**	**3**
Vitamin E	**0.10**	**0.10**
Total	**100**	**100**
Calculated nutrient content		
Crude fat	**0.06**	**0.06**
Dry matter	**89.03**	**89**
Moisture	**10.97**	**11**
ME (Kcal/Kg)	**3000**	**3050**
Protein (%)	**21.5**	**19.5**
Calcium	**0.81**	**0.83**
Available P	**0.40**	**0.41**
Lysine	**1.19**	**1.18**
Methionine	**0.48**	**0.49**
Methionine+ cystine	**0.81**	**0.73**

For each kg of the diets; vitamin A, 9,000,000 IU; vitamin D3, 2,000,000 IU; vitamin B1, 1,800 mg; vitamin B2, 6,600 mg; vitamin B3, 10,000 mg; vitamin B6, 3,000 mg; vitamin B12,15 mg; vitamin E, 18,000 mg; vitamin K3, 2,000 mg; vitamin B9, 1,000 mg; vitamin B5, 30,000 mg; folic acid, 21 mg; nicotinic acid, 65 mg; biotin, 14 mg; choline chloride, 500,000 mg; Mn, 100,000 mg; Zn, 85,000 mg; Fe, 50,000 mg; Cu, 10,000 mg; I, 1,000 mg; Se, 200 mg.

RESULTS AND DISCUSSION

Effects of salbutamol on performance of broiler chickens are given in Table 2. Results from this experiment indicated that feed intake at 1-42 days was reduce by 10, 20 and 30 mg/kg salbutamol compared with the control group ($p<0.0001$). Body weight gain and final body weight were reduce by 10 and 20 mg/kg salbutamol compared with the other treatments ($p<0.0001$). The feed conversion ratio was significantly different by 10 mg/kg salbutamol compared with the control group ($p<0.05$). This finding is in agreement with a study by Fawcett et al [10], that showed that feed intake, body weight gain in birds fed salbutamol were similar to those of control birds. Ocampo et al [29] invistigated the average of feed conversion ratio and body weight in birds feeding of 0.25 ppm clenbuterol was not significantly. Feed intake is reduced linearly with increasing cimaterol levels [12-27-31]. Effects on feed efficiency were not always the same [5] and Moser et al [27] found no significant effect, while Jones et al [12] found a positive effect, but there was no apparent correlation of level of cimaterol to feed efficiency. Prince et al [31] found a slightly improved feed conversion, but the effect was not significant. The present data indicated that salbutamol affected feed intake, body weight gain and final body weight gain of the broilers chicken, similar to other beta-adrenergic agonist but salbutamol have not effect on feed conversion. It is suggested that 5 mg/lit salbutamol increased feed intake, body weight gain and final body weight gain; however, further experiments should be conducted to see if lower doses of salbutamol can be effective in this respect.

Table 2. Effect of salbutamol utilization on production performance of broiler chickens at whole period of production (42 days)

Salbutamol	feed intake (g)	weight gain (g)	feed conversion ratio	final body weight(g)
0 (control)	3153.47 ^{ab}	1637.69 ^{a}	1.92 ^{a}	1680.72 ^{a}
5 mg/lit	3370.39 ^{a}	1664.66 ^{a}	2.02 ^{ab}	1707.69 ^{a}
10 mg/lit	3409.99 ^{a}	1646.31 ^{a}	2.07 ^{ab}	1689.34 ^{a}
15 mg/lit	3293.87 ^{a}	1548.21 ^{ab}	2.12 ^{ab}	1591.24 ^{ab}
10 mg/kg	2858.03 ^{c}	1257.37 ^{c}	2.28 ^{b}	1300.4 ^{c}
20 mg/kg	2908.82 ^{bc}	1317.91 ^{c}	2.21 ^{ab}	1360.94 ^{c}
30 mg/kg	2890.61 ^{c}	1428.50 ^{abc}	2.04 ^{ab}	1471. 53 ^{abc}
SEM	56.64	53.14	0.06	53.14
P value	< 0.0001	< 0.0001	0.019	< 0.0001

CONCLUSION

Based on results of current study it can be concluded that feeding salbutamol to broiler chickens may be cause inconsistent effects on production performance. This inconsistency previously reported also by other researchers using different beta-adrenergic agonist compounds.

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