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PROFITABILITY OF USING SALBUTAMOL (A BETA-ADRENERGIC AGONIST) AS A GROWTH PROMOTER OF BROILER CHICKENS

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ABSTRACT

This study was conducted to evaluate the effect of salbutamol (beta-adrenergic agonist) on performance of broiler chickens. A total of 60 (Cobb) day-old broiler chickens were randomly assigned to 3 groups each 20 birds per pen. Groups include: control, 5, and 15 mg salbutamol per kg diet. The experiments was designed for 3 weeks. Results from this experiment indicated that. growth rate, body weight gain and food consumption were significantly increased by using 5 mg/kg salbutamol while a significant decrease was attained by 15mg/kg salbutamol as compared with the control group ($P \leq 0.05$). The feed conversion ratio was significantly increased by 5 mg/kg salbutamol compared with the control group ($P \leq 0.05$).Meanwhile, eviscerated and deboned carcass were significantly increased by 5mg/kg salbutamol but decreased significantly by 15mg/kg salbutamol as compared with the control group ($P \leq 0.05$).In conclusion, it seems that feeding salbutamol as a beta-adrenergic agonist, can improve growth performance in broiler chickens at dose of 5mg/kg.

Key words: Salbutamol, broilers, feed conversion ratio, gain, carcass.

INTRODUCTION

Continuous attempts to increase growth rate of meat-type chickens in poultry industry have been accompanied by excessive fatness which is not desired by most of consumers. Therefore, B-adrenergic agonists were

found to enhance leaness in livestock species and would not likely represent a credible risk to the consumers of edible tissues of properly treated animals ***(Smith, 1998).***

Muscular hypertrophy is one of the most consistent effects observed after the administration of β-agonists. This may be related to an increase in satellite cells proliferation, stimulation of myofibrillar protein synthesis and a decrease in myofibrillar protein degradation ***(Etherton and Smith, 1991)***. There is evidence that β- agonists can induce muscular

Hyper trophy by a direct effect on transcription of genes encoding myofibrillar proteins ***(Malucelli et al., 1994)***. β- agonists in particular, increase the degradation of adipocytes and adipocytes metabolism ***(Mersmann, 2002)***. The degradation of triacyglycerol, in the adipose tissues, is initiated by hormone-sensitive lipase following activation of the β- adrenergic receptors ***(Mersmann, 1998).***

The positive effects of β-agonists on performance and repartitioning in meat producing animals, including poultry, have been documented ***(NRC, 1990; Wellenreiter, 1991 and Smith, 1998).*** The positive effects of β-agonists were more pronounced in sheep and cows, which is in contrast to birds and pigs having low and intermediate activity, respectively ***(Gwartney et al., 1991).*** Although the responses vary according to the species, the type of β-agonist which is used and duration of treatment may also be involved ***(Fennessy et al., 1990; Zare Shahneh et al., 2001)***.

Many authors have discussed that chickens receiving diet containing R-salbutamol had less abdominal and carcass fat. The decrease in carcass fat may be due to inhibition of lipid synthesis, while the reduction in the relative weight of abdominal fat may suggest lipolytic activity ***(Fawcett et al., 2004)*** , while Consuming various levels of terbutalin and salbutamol has improved the performance of chicken as mentioned by ***Ansari-Pirsaraei et al., (2003)***.

The effects of salbutamol on performance of broiler chickens studied by ***Anjum et al., (2013)*** revealed that Salbutamol intensified body weight gain and improved feed conversion ratio. Protein and bone weight were also significantly increased while fat content was depressed alone with lessen mortality rate when administrated at a dose rate of 5, 10 and 15 mg per kg. 5mg Salbutamol was the best dose as assessed to improve Body weight Gain, Feed conversion ratio and protein contents in meat.

MATERIALS AND METHODS

One day old broiler chickens were randomly assigned to 3 treatments each 20 birds per pen. Groups included to (group1: control, group2: 5 mg salbutamol per kg of body weight and group3: 15mg salbutamol per kg of body weight). From days 21 to 42 of the rearing, salbutamol was added to ration. The birds were reared until 42 d of age, The groups were accommodated in separated pens in experiment construction room on deep litter, maintained under natural environmental condition (25 -30 C°), free access to feed, water and

continuous lightening program. Live Body weight and feed consumption were recorded weekly. The variables considered at the end of experiment were growth rate, body weight gain, feed conversion, feed intake, eviscerated and deboned carcass.

Growth parameters measurements:

1. Live body weight:

The chicks in each group were weighed at the end of the 3rd week (21 day) of age to obtain the average initial body weight in grams then weighed weekly till the end of the experiment to be used in calculating other growth parameters.

2. Body weight gain

The average live body weight gain was calculated by subtracting the average initial live weight of a certain period from the average final live weight of the same period. Total live weight gain was divided by the number of weighted birds to get the average live weight gain per bird.

3. Feed intake and feed efficiency:

a) Feed intake:

The diets were provided daily regularly and the weekly feed intake per group was calculated as the difference between the weights of the offered feed and the remained part, then divided by the number of the chicks in that group to obtain the average feed intake per chick per week. Then the average feed intake per chick throughout the experimental period (5thwk) for each subgroup was calculated.

b) Feed conversion ratio (FCR):

Feed conversion was calculated according to the following formula:

$$\text{FCR} = \frac{\text{Average feed consumption per chick (gm)}}{\text{Average body weight gain per chick (gm)}}$$

4. Evisceration and removal of bone:

At the end of experimental period (42 days) five birds from each group were randomly selected, weighed alive and then slaughtered. After slaughtering and evisceration carcass's weight was recorded.

Finally after removal of bone the carcass was weighed again and compared with live b.w.t.

RESULTS AND DISCUSSION

Table (1): Effect of adding 5mg/kg or 15mg/kg body weight of Salbutamol on growth rate of broilers. (Mean ± SE) (N=5)

Groups	21thday	28thday	35th day	42nd day
Control	866.3±0.37	1361.2±0.23	1918.3±0.44	2372±0.52
Group II	866.4±0.35$^{*\#}$	1380.2±0.24$^{*\#}$	1950.9±0.50$^{*\#}$	2450±0.52$^{*\#}$
Group III	866.7±0.23$^{*\#}$	1310.7±0.32$^{*\#}$	1775.8±0.34$^{*\#}$	2210.2±0.4$^{*\#}$

Table (2): Effect of salbutamol 5mg/kg or 15mg/kg body weight on body weight gain of broilers. (Mean ± SE) (N=5)

Groups	28thday	35thday	42nd day
control	463.06±0.22	548.28±0.37	630.25±0.38
Group II	489.3±6.58$^{*\#}$	560.87±2.15$^{*\#}$	660.84±4.91$^{*\#}$
Group III	447.62±0.50$^{*\#}$	487.25±14.69$^{*\#}$	540.25±0.39$^{*\#}$

Table (3): Effect of adding 5mg/kg or 15mg/kg body weight of Salbutamol on feed consumption along the entire experiment. (N=5) (Mean±SE)

Group	Feed intake (gm)
Control	6300.00±13.25
Group II	7980.00±15.23$^{*\#}$
Group III	5780.00±10.23$^{\#}$

Table (4): Effect of adding 5mg/kg and 15mg/kg body weight of Salbutamol on feed conversion ratio of broilers (N=5) (Mean±SE)

Group	Food conversion Ratio
Control	0.11±0.037
Group II	0.13±0.007*#
Group III	0.17±0.005#

Table (5): Effect of adding 5mg/kg or 15mg/kg body weight of Salbutamol on eviscerated carcass weight of broilers (N=5) (Mean±SE)

Group	Eviscerated carcass (gm)
Control	1744±9.75
Group II	1839±10.32*#
Group III	1657±12.15*#

Table (6): Effect of adding 5mg/kg or 15mg/kg body weight of Salbutamol on deboned carcass of broilers (N=5) (Mean±SE)

Group	Deboned carcass (gm)
Control	754±13.56
Group II	856±15.23*#
Group III	672±15.89*#

The present study spotlighted the effect of salbutamol as growth promoter on growth rate, feed intake, body weight gain, feed conversion ratio, eviscerated carcass and deboned carcass.

It has been observed that there was a significant increase in growth rate of broilers in group II (5mg) Table (1), while there was a significant decrease in group III (15mg) when compared with the control group I. Regarding the effect of salbutamol on body weight (gm); it was found that at a dose of 5mg/kg the body weight was significantly increased. While at a dose of 15mg/kg the body weight was significantly decreased as compared with the control group. These results agree with the founds **of *Yousefi et al., (2011)*** in quails **and *Zare-Shahneh et al., (2012)*** in broilers.

Effect of Ractopamine (one of beta adrenergic agonist) on muscle cell proliferation has also been reported by ***Grant et al. (1990)*** which in turn, cause an increase in muscle weight so increased in the weight of the broilers.

This increase was attributed to the effect of beta agonists, as a repartitioning agent, increasing the blood flow to muscular tissues and as a result more nutrients are put at the disposal of these tissues ***(Mersmann, 1998; Mersmann, 2002)*.** This finding is consistent with the observations of ***Takahashi et al., (1993).***

It has been observed that there was a significant increase in body weight gain of broilers in group II (5mg) Table (2), while there was a significant decrease in group III (15mg) when compared with control group. Regarding feed intake and body weight gain, it has been observed that there was a significant increase in feed intake and body weight gain of broilers in group II (5mg), while there was a significant decrease in group III (15mg) when compared with control group. These results are in agreement with ***Yousefi et al., (2011)*** who suggested that 5 mg/liter of salbutamol increased feed intake, body weight and final body weight gain.

An improvement in weight gain may be associated to the fact that beta agonist compounds decrease protein degradation ***(Li and Jefferson, 1997; Lopez-Carlos et al., 2010)*** and increase protein accumulation ***(Zhang et al., 1995; Beerman, 2002).*** Beta agonists may also decrease lipogenesis and increase lipolysis ***(Ferreira et al., 2013);*** therefore

energy utilization and the efficiency of consumed energy were improved for higher weight gain of animal ***(Mersmann, 2002).*** Clenbutrol one of beta agonists at concentration of 0.8 ppm diet totally prevented glucocorticoid induced protein loss in all muscles so increase weight gain as reported by ***Agbenyega and Wareham (1992)***.

Weight gain was affected by Salbutamol and was higher in all treated groups compared with the control groups. Our result is consistent with many reports ***(Buyse et al., 1991; Zamiri and Izadifard, 1995)*** they reported an increase in weight gain that was not consistant with others ***(Bakir et al., 2001; Fawcett et al., 2004).***

It has been observed that there was a significant increase in feed consumption of broilers in group II (5mg) **Table (3)**, while there was a decrease in group III (15mg) Table (6) when compared with control group.

Feed intake was reduced linearly with increasing cimaterol levels reported by ***Ornelas et al., (1990).*** Meanwhile ,other researchers showed that using β receptor agonists had no change in feed intake of lambs ***(Richardson et al., 1991),*** cows ***(Ricks et al., 1984)*** pigs ***(Warriss et al., 1990)*** on broiler chicks ***(Kheiri, et al., 2011).***

Decline in food intake in female quails fed diets containing Salbutamol compared with the control group is unclear but may be due to the food intake suppressant effect of high doses of Salbutamol via a vagally mediated pathway ***(Howes and Forbes, 1987).*** Such an effect has not been reported in chickens given other β-agonists ***(Wellenreiter, 1991)*** nor has it been observed in pigs given diets containing Salbutamol ***(Cole et al., 1987).***

Concerning the effect of Salbutamol on feed conversion there was a significant increase in food conversion ratio of broilers in group II (5mg) **Table (4)**, while there was a non-significant increase in group III (15mg) when compared with control group this is completely in agreement with ***Yousefi et al., (2011)*** who recorded that this increase in food conversion by both doses used (5 or 15mg/kg).while ***Ocampo et al., (1998)*** invistigated the average of feed conversion ratio and body weight in birds feeding of 0.25 ppm Clenbuterol and stated that it was not significantly increased. ***Pince et al., (1985)*** found a slightly decreased feed conversion, but the effect was not significant. Also, ***Ansari-pirsaraei et al. (2003)*** reported that using 5ppm Terbutaline in diet of broiler chicks decreased feed conversion ratio of chicks. The differences in the results were proposed by ***Fennessy et al., (1990)*** due to the differences in the type of β-agonist administered, species and duration of the treatment and interaction between these factors**.**

It has been observed that there was a significant increase in eviscerated carcass of broilers in group II (5mg) **Table (5)**, while there was a significant decrease in group III (15mg) when compared with control group. Meanwhile, there was a significant increase in deboned carcass of broilers in group II (5mg) **Table (6),** while there was a significant decrease in group III (15mg) when compared with control group. These results are in agreement with ***Ansari-pirsaraei et al., (2003)*** who reported the ability of Terbatuline (5mg/kg) to enhance carcass components weight consistent with the action of the beta adrenergic agonist on mammalian skeletal muscle ***(Byttery and Dawson, 1997).***

Effect of Ractopamine on muscle cell proliferation has also been reported by ***Grant et al. (1990)*** which in turn, cause an increase in muscle weight and consequently increased the weight of the carcass.

Other investigators realized that Clenbutrol 1mg/kg increased the dressing percentage in commercial broilers, 28 days old, fed on diets supplemented with the drug until 49 days of age. ***(Wang et al., 1994).*** On the other hand, ***Kiranadi and Putra, (2012)*** had pointed that beta adrenergic agonist effect on fat mobilization through the mechanism of stimulus, so doesn't affect carcass weight or body weight.

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استخدام السالبيتامول من مجموعه بيتا الأدرينالينيه كمحفز للنمو

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*****معهد بحوث صحة الحيوان معمل فرعي طنطا***

استهدفت هذه الدراسة تأثير محفز النمو من مجموعه بيتا2 الادرينالينيه سالبيتامول في الدجاج من حيث معدل النمو والتحويل الغذائي وكذا الكفاءة الغذائية بالإضافة إلى معدل التصافي والتشافي علي كتاكيت تسمين من نوع كب .

قسمت الكتاكيت الي ثلاثه مجاميع متساويه تحتوي كل مجموعه علي عدد 20كتكوت وقدمت عليقه أساسيه فقط للمجموعة الأولى (مجموعه ضابطه سلبيه) بينما المجموعة الثانية والثالثة فقد غذيت علي العليقة الأساسية مضاف إليها السالبيتامول بمعدل (5 ميللي جرام/كجم من الوزن) و (15 ميللي جرام/كجم من الوزن) علي الترتيب تم تسجيلها أسبوعياً وتم إضافة محفز النمو السالبيتامول بمستوياته المختلفة في اليوم 21 من العمر كبداية للتجربة وحتى نهايتها (42 يوم) مع تسجيل كميه العقار المضافة يوميا بالمعدل المبين سابقا لكل كيلو جرام عليقه.

وعليه فيمكن تلخيص النتائج المتحصل عليها كالأتي:

- وجد أن السالبيتامول يؤدي الي زيادة معنوية في الوزن ومعدل الزيادة في الوزن ومعدل استهلاك العلف في المجموعة المعالجة بالجرعه5 ميللي جرام/كجم من الوزن بينما يحدث نقص معنوي في المجموعة المعالجة بالجرعه15ميللي جرام/كجم من الوزن عند مقارنتها بالمجموعة الضابطة.
- ووجد أيضا أن السالبيتامول يؤدي إلى زيادة معنوية في معدل التحويل الغذائي في المجموعة الثانية بينما يحدث نقص معنوي في المجموعة الثالثة المعالجة بالجرعة 15 ميللي جرام/كجم من الوزن عند مقارنتها بالمجموعة الضابطة.
- وقد لوحظ وجود زيادة معنوية في معدل التصافي والتشافي في المجموعة الثانية بينما يحدث نقص معنوي في المجموعة الثالثة المعالجة بالجرعة 15 ميللي جرام/كجم من الوزن عند مقارنتها بالمجموعة الضابطة.