Effects of Beta Adrenergic Agonist on Female Broiler Chicks

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ABSTRACT

Present experiment was carried out to investigate the effects of added ractopamine as growth promoter on broiler chicks. Three experimental diets were fed to 180 broiler chicks at the growth periods (3-6 weeks of age). Three levels ractopamine (0, 5 and 10 mg/kg) with five replicate was fed. A completely randomized design was used. Growth performance and blood biochemical parameters were measured. Daily body weight gain (DBWG), feed intake (FI) and feed conversion ratio (FCR) were not affected significantly by different levels of ractopamine in female broiler chicks. Ractopamine (10 mg/kg) significantly (p<0.05) decreased blood serum triglyceride and blood urea nitrogen. On the other hand glucose, cholesterol, uric acid and albumin were reduced (p<0.05) in the blood serum with ractopamine.

Key words: Ractopamine, performance, blood biochemical parameters, broiler chicks.

Introduction

Excess carcass fatness in broiler chicks is now of focus to both whom consume and produce. In taking high amounts of fat could be certain cause for cancer and cardiovascular diseases [8]. Fat deposition can be influenced by environmental causes such as nutrition and genetic factors [9]. Genetic manipulate influences the quantity of fat while, nutrition factors cause both quantity and quality of fat. Therefore it’s better to mostly focus on the nutrition factors [11]. Fat metabolism can be manipulated by some feed additives. Ractopamine hydrochloride (RAC) is used for altering fat metabolism and deposition, according to their lipolytic and growth promoter properties. Since 1963, β-adrenergic (β-AR) agonist was used in broiler diets, due to its effects on growth and carcass traits [4]. In 2003 the Food and drug administration approved RAC is a β-AR agonist to be used in cattle and swine diets [22]. β-AR agonists modify effects on growth and fat metabolism [13]. These drugs mediated protein turn over and muscle growth [17]. Glucose lactate and insulin in the blood serum were increased by β-AR agonists [1,2,14].

The aim of this research was to consider the effect of RAC on growth performance and blood biochemical parameters in female broiler chickens.

Materials and Methods

One hundred eighty (180) Ross female broiler chicks were randomly distributed into 12 pens, allocated to three dietary treatment groups with 5 replicates for each treatment. The trail was conducted using 3×5 completely randomized design for treatments (five replicates per treatment) with three levels of ractopamine as the main effect. Diets were formulated to contain three levels of ractopamine (0, 5 and 10 mg/kg). Ingredients and details of the designated diets are presented in Table 1.

Table 1: Ingredients and composition of the experimental diets.

<table>
<thead>
<tr>
<th>Diet</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ractopamine (mg Kg⁻¹)</td>
<td>0</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Ingredients (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basal Portion¹</td>
<td>99.959</td>
<td>99.959</td>
<td>99.959</td>
</tr>
<tr>
<td>Ractopamine</td>
<td>0</td>
<td>0.001</td>
<td>0.0005</td>
</tr>
<tr>
<td>Sand</td>
<td>0.041</td>
<td>0.04</td>
<td>0.0405</td>
</tr>
</tbody>
</table>

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Table 2: Effects of supplemental dietary Ractopamine on performance of female broiler chicks.

<table>
<thead>
<tr>
<th>Ractopamine (mg kg⁻¹)</th>
<th>ADG (g bird⁻¹ day⁻¹)</th>
<th>Feed Intake (g bird⁻¹ day⁻¹)</th>
<th>FCR²</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>78.670</td>
<td>159.467</td>
<td>2.0698</td>
</tr>
<tr>
<td>5</td>
<td>76.811</td>
<td>149.986</td>
<td>2.0269</td>
</tr>
<tr>
<td>10</td>
<td>73.933</td>
<td>147.097</td>
<td>1.925</td>
</tr>
<tr>
<td>P Value</td>
<td>n.s</td>
<td>n.s</td>
<td>n.s</td>
</tr>
<tr>
<td>SE</td>
<td>2.890</td>
<td>3.076</td>
<td>0.072</td>
</tr>
</tbody>
</table>

1-ADG: Average daily gain; 2-FCR: Feed conversion ratio; 3-S.E: Standard error.

Results and Discussion

The effect of RAC on DBWG, FI and FCR are presented in Table 2. RAC didn’t have any significant effects on the mentioned parameters. [3] announced no significant effect of clenbuterol on weight gain and final body weight of broilers. The Addition of cimaterol to the diet of broiler did not improve DBWG [4]. In contrast, several researchers have shown the positive effect of β-AR agonist on growth rate [25,17,20,7,]. [13] reported an improvement in DBWG and FI of broilers according to supplemental β-AR agonist. The response of broilers to supplemental β-AR agonist can be different in type and dose of β-AR agonist, broiler strain, age and also duration of β-AR agonist consumption [13,3]. The effect of RAC on blood parameter is presented in Table 3. Blood glucose was increased by using RAC (p<0.05). Blood cholesterol, uric acid, BUN and albumin were decreased by adding RAC (p<0.05). Many hormones are effective in releasing insulin. β-AR agonist (mainly epinephrine) with stimulating the secretion of glucose block the desertion of insulin [16]. β-AR agonist increased blood glucose [2,6,15]. Increasing the amount of glucose by the utilization β-AR agonist could be the reason for enhance of hormone sensitive lipase on fats and their uses besides glucose as β-oxidation [17]. Using β-AR agonist decreased the amount of blood insulin of sheep [13]. This decreasing was the reason for the increase of blood glucose amount and lipolysis. On the other hand by using β-AR agonist gluconeogenesis and glucose increased [8,21]. β-AR agonist increased blood glucose as the other researchers showed [6,15]. β-AR agonist plus increasing gluconeogenesis, block glycolysis [22]. Blood cholesterol and triglyceride decreased when RAC was added to the diet. These results indicated that RAC alters the trend of fat metabolism also shifts fat towards β-oxidation. RAC was effective in the mobilization of the fat and their movement according to the other researchers [11]. RAC reduced uric acid, BUN and albumin. Changes in blood uric acid, BUN and albumin suggest an involvement of RAC in protein metabolism (Table 3). Especially the reduction of BUN and uric acid results the increase of protein metabolism and maybe sparing effects in using protein after adding RAC. The results of RAC in increasing blood protein and also percentage of thigh confirm the finding of [11], who reported simulative effect of RAC in protein synthesis. Our results are in agreements with the report [24], regarding simulative effect of RAC on protein synthesis.
Table 3: Effects of supplemental dietary Ractopamine on blood biochemical parameters of female broiler chicks.

<table>
<thead>
<tr>
<th>Ractopamine (mg kg⁻¹)</th>
<th>Glucose (mg dL⁻¹)</th>
<th>Cholesterol (mg dL⁻¹)</th>
<th>Triglyceride (mg dL⁻¹)</th>
<th>Uric Acid (mg dL⁻¹)</th>
<th>Bun¹ (mg dL⁻¹)</th>
<th>Albumin (g dL⁻¹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>310.443</td>
<td>101.09</td>
<td>97.728</td>
<td>4.371</td>
<td>1.866</td>
<td>5.205</td>
</tr>
<tr>
<td>5</td>
<td>287.605</td>
<td>67.32</td>
<td>90.851</td>
<td>3.851</td>
<td>1.159</td>
<td>3.692</td>
</tr>
<tr>
<td>10</td>
<td>339.499</td>
<td>66.18</td>
<td>64.244</td>
<td>3.226</td>
<td>0.992</td>
<td>3.696</td>
</tr>
</tbody>
</table>

P Value: * * * * * P Value
SE: 16.772 8.307 6.093 0.225 0.220 0.346

Columns values with same superscript or not superscript are not significantly different (P<0.05).

Conclusion:
RAC didn’t have any interference in the performance of female broiler chicks. RAC increased blood glucose amount and reduced triglyceride and cholesterol so it affected the β-oxidation. RAC stimulate protein synthesis and changes trend of fat metabolism.

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