Effect of Synbiotic on Performance and Serum Biochemical Parameters of Ostrich Chicks

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Received: 20 September 2013
Accepted: 21 November 2013

ABSTRACT

The present experiment was conducted to investigate the effect of synbiotic on performance and serum biochemical parameters of ostrich chicks. Forty eight day-old ostrich chicks were divided into 4 treatments with 4 replicates of 3 ostrich chicks in completely randomized design for 8 weeks. Dietary treatments included basal diet (control) and basal diet with 0.5, 1 and 1.5 g/kg synbiotic. Feed Intake (FI), body weight (BW) and feed conversion ratio (FCR) were measured during the whole period of the experiment (0-8 wk of age). Additionally, blood samples were taken at the end of the experiment and analyzed for serum biochemical parameters. The results showed that 1 g/kg synbiotic inclusion in the diet significantly improved BW and FCR of the chicks compared to control group (p<0.05). Furthermore, 1.5 g/kg synbiotic substantially increased blood glucose but decreased cholesterol (p<0.05). Serum total protein and uric acid also decreased in all dietary levels of synbiotic compared to control group (p<0.05). Regarding these results, supplementation of 1 g/kg synbiotic appears to be effective on growth performance and serum biochemical parameters of ostrich chicks.

Keywords: Ostrich chicks, Synbiotic, Growth performance, Serum biochemical parameters

INTRODUCTION

Among the poultry species, fermentative digestion of the plant polysaccharides, cellulose and hemicellulose is developed in the ostrich. Due to the fact that, adult ostriches are mostly herbivorous in their natural environment (Milton et al., 1994), their colon is markedly lengthened up to 16m (Bezuidenhout, 1986). This adaptation, accompany the numerous haustrations in its proximal part, makes the colon an appropriate site for fermentative digestion. Short chain fatty acids (SCFA) including acetate, propionate and butyrate are the main end products of fermentative digestion of polysaccharides in herbivorous birds. Ostrich obtains the
primary source of metabolizable energy from SCFA. Nevertheless, the ostrich ability to use fiber and obtaining energy from that is lower in younger ostriches and increase with age (Swart et al., 1993; Cooper et al., 2004). Additionally, there is no doubt that in the case of SCFA production, fibrous ingredients compared to grains such as maize assumes economic significance regarding commercial ostrich production and producers always seeking new ways to increase the animals performance beside considering its cost efficiency.

Probiotics are live microbial food supplement that favorably influence the host animal by promoting its intestinal microbial balance. A prebiotic is defined as a food ingredient that is not digested in the upper gut and beneficially affects the host by selectively stimulating the growth, activity, or both of one or a limited number of bacterial species already resident in the colon. Synbiotics, are the combination of probiotics and prebiotics. Actually in the form of synbiotics, prebiotics are readily available substrates for probiotics to grow better and improve the survival of them (Collins and Gibson, 1999). According to Awad et al. (2008), synbiotics are able to help better absorption of glucose in poultry. Liong and Shah (2006) concluded that the use of synbiotics consumption in broilers regulates the concentration of the organic acids and reduce cholesterol levels in rats.

To our knowledge, despite all the mentioned researches, information in the field of synbiotics impact on ostriches is scarce and some experimental studies are warranted. Therefore, this experiment was conducted to investigate the effect of different levels of synbiotic on performance and serum biochemical parameters of ostrich chicks.

**MATERIALS AND METHODS**

*Animals and Dietary Treatments*

In this experiment, total of 48 day-old Black Necked ostrich chicks were purchased from a local hatchery, individually weighed and allocated to 4 dietary treatments with 4 replicates of 3 ostrich chicks each in completely randomized design for 8 weeks. Throughout the experimental period, birds had free access to clean water. The dietary treatments were designed as follows: 1) The basal diet without synbiotic; 2) The basal diet + 0.5 g/kg synbiotic; 3) The basal diet + 1 g/kg synbiotic; 4) The basal diet+ 1.5 g/kg synbiotic. Dietary treatments were applied from day 1 to 56 days of age. The synbiotic (Biomin IMBO) in this experiment is composed of *Enterococcus faecium* (5×10^{11}cfu/kg), fructose oligosaccharides and phycophytic (extracted from seaweed) carbohydrates. The composition and chemical analysis of the basal diet are given in Tables 1.

*Performance Parameters*

BW and FI of each pen were recorded for the whole period and the FCR was calculated at the end of the experiment.
Table 1. Ingredients and composition of the diet

<table>
<thead>
<tr>
<th>Ingredient (%)</th>
<th>0-8 weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn</td>
<td>46.14</td>
</tr>
<tr>
<td>Alfalfa</td>
<td>3.5</td>
</tr>
<tr>
<td>Soybean meal</td>
<td>34.57</td>
</tr>
<tr>
<td>Wheat bran</td>
<td>5</td>
</tr>
<tr>
<td>Barley</td>
<td>4.97</td>
</tr>
<tr>
<td>MCP</td>
<td>1.37</td>
</tr>
<tr>
<td>DL-Methionine</td>
<td>0.09</td>
</tr>
<tr>
<td>Vitamin and mineral premix(^1)</td>
<td>1</td>
</tr>
<tr>
<td>Limestone</td>
<td>2.93</td>
</tr>
<tr>
<td>Sodium chloride</td>
<td>0.43</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
</tr>
</tbody>
</table>

**Calculated composition**

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy kcal/kg</td>
<td>3100</td>
</tr>
<tr>
<td>Protein (%)</td>
<td>21</td>
</tr>
<tr>
<td>Lysine (%)</td>
<td>1.1</td>
</tr>
<tr>
<td>Met+Cys (%)</td>
<td>0.07</td>
</tr>
<tr>
<td>Calcium (%)</td>
<td>1.5</td>
</tr>
<tr>
<td>Available phosphorous (%)</td>
<td>0.45</td>
</tr>
<tr>
<td>Crude fiber (%)</td>
<td>4.2</td>
</tr>
</tbody>
</table>

\(^1\) Vitamin premix per kg of diet: vitamin A (retinol), 2.7 mg; vitamin D3 (Cholecalciferol), 0.05 mg; vitamin E (tocopheryl acetate), 18 mg; vitamin K, 2 mg; thiamine 1.8 mg; riboflavin, 6.6 mg; panthothenic acid, 10 mg; pyridoxine, 3 mg; cyanocobalamin, 0.015 mg; niacin, 30 mg; biotin, 0.1 mg; folic acid, 1 mg; choline chloride, 250 mg; antioxidant 100 mg; Mineral premix per kg of diet: Fe (FeSO4.7H2O, 20.09% Fe), 50 mg; Mn (MnSO4.H2O, 32.49% Mn), 100 mg; Zn (ZnO, 80.35% Zn), 100 mg; Cu (CuSO4.H2O), 10 mg; I (KI, 58% I), 1 mg; Se (Na2SeO3, 45.56% Se), 0.2 mg.

**Serum Biochemical Parameters**

At the end of experiment, blood samples were taken from wing vein of 2 ostriches per pen using a sterile syringe. Then blood samples were centrifuged at 1500 rpm for 20 minutes and serum was separated. Serum biochemical parameters were determined using commercial kit (Pars Azmoon Co., Ltd., Tehran, Iran) and auto analyzer.

**Statistical Analysis**

Data were statistically tested by analysis of variance using SAS (9.1) statistical software and the means were compared by Duncans multiple range. Probability values of less than 0.05 (p<0.05) were considered significant.

**RESULTS**

**Performance Parameters**

The result of the performance parameters are given in Table 2. The group fed 1g/kg of synbiotic (Biomin IMBO) showed the greatest BW and its difference was found significant
compared to other treatment groups (p<0.05). Furthermore, the greatest FI was observed through feeding of 1g/kg synbiotic at the end of the 8 weeks of age compared to other treatment groups (p<0.05). Additionally, 1g/kg dietary inclusion of synbiotic caused the lowest FCR in comparison to control and other groups (p<0.05).

Table 2. Performance parameters of the control and synbiotics treated ostriches (0-8 wk)

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Body weight (g)</th>
<th>Feed intake (g)</th>
<th>FCR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>4992±51.62b</td>
<td>9810±207.09a</td>
<td>1.96±0.057a</td>
</tr>
<tr>
<td>0.5 g/kg Synbiotic</td>
<td>5425±105.42b</td>
<td>9243±234.04b</td>
<td>1.70±0.048a</td>
</tr>
<tr>
<td>1 g/kg Synbiotic</td>
<td>6322±69.84a</td>
<td>10035±174.30a</td>
<td>1.58±0.041b</td>
</tr>
<tr>
<td>1.5 g/kg Synbiotic</td>
<td>4716±91.79b</td>
<td>9076±132.17b</td>
<td>1.92±0.066a</td>
</tr>
</tbody>
</table>

Means with different superscript within a column are significantly different (P< 0.05); FCR, feed conversion ratio.

Serum Biochemical Parameters

The results of the serum biochemical parameters are given in Table 3. The greatest glucose concentration was obtained by dietary inclusion of 1.5 g/kg synbiotic (p<0.05). However cholesterol and uric acid concentrations decreased using graded levels of synbiotic and the lowest levels observed by addition of 1 g/kg synbiotic (p<0.05). Our results showed that dietary inclusion of the synbiotic decreased blood protein (p<0.05). No significant change of serum calcium and urea observed by applying graded levels of synbiotic.

Table 3. Serum biochemical parameters of the control and synbiotic treated ostriches (0-8 wk)

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Glucose (mg/dl)</th>
<th>Cholesterol (mg/dl)</th>
<th>Total protein (g/dl)</th>
<th>Uric acid (mg/dl)</th>
<th>Urea (mg/dl)</th>
<th>Calcium (mg/dl)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>196.92±0.19b</td>
<td>95.04±0.26a</td>
<td>2.39±0.59a</td>
<td>11.26±0.23a</td>
<td>0.96±0.06</td>
<td>30.6±0.32</td>
</tr>
<tr>
<td>0.5 g/kg Synbiotic</td>
<td>210.06±0.27b</td>
<td>92.34±0.52a</td>
<td>2.26±0.53b</td>
<td>10.91±0.36b</td>
<td>0.92±0.05</td>
<td>31.32±0.26</td>
</tr>
<tr>
<td>1 g/kg Synbiotic</td>
<td>206.46±0.14b</td>
<td>86.04±0.72b</td>
<td>2.22±0.54b</td>
<td>10.64±0.34b</td>
<td>0.86±0.04</td>
<td>32.76±0.38</td>
</tr>
<tr>
<td>1.5 g/kg Synbiotic</td>
<td>216.72±0.25a</td>
<td>88.74±0.27b</td>
<td>2.27±0.57b</td>
<td>10.72±0.28b</td>
<td>0.94±0.08</td>
<td>33.30±0.23</td>
</tr>
</tbody>
</table>

Means with different superscript within a column are significantly different (P< 0.05).

DISCUSSION

The improved BW and FCR of the birds in this study is matched with the results of Jin et al. (1998) who studied the effect of lactobacillus cultures in broilers and found that BW significantly increased in comparison with control group. In the case of ostrich chicks, probiotics like natural yoghurt has been used in order to colonize the gut with useful species of bacteria (Deeming et al., 1996). Due to the fact that young ostrich chicks can not use fibers as well as old ostriches (Cooper et al., 2004), here synbiotic may has contributed in development of healthy microflora in the hindgut, obtaining more energy from the nutrient fermentation in the caca and consequently have improved the performance of ostriches. In contrast to these results, Gri et al. (2008) failed to show any significant impact of probiotics in rhea chicks.

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In the current trial, synbiotic supplementation increased blood glucose concentration in ostriches. In contrast, Mokhtari et al. (2009) by studying the synbiotics effect on blood glucose of broilers found that serum glucose was not affected significantly. On the other hand, Awad et al. (2008) reported the increased glucose transport in the gut using synbiotics. They believed that synbiotics may affect glucose transporters in the intestine by increasing SCFA production. Shams Sharagh et al. (2008) studied the probiotics effect on blood uric acid in broilers and found that uric acid concentration significantly decreased in comparison with control group which was in consistence with the obtained results of the current study. They also speculated that probiotics application might increase the population of carbohydrate degrading bacteria and reduce the proteolytic bacteria which increase the protein digestion and reduced degradation.

The serum cholesterol concentration diminished by dietary inclusion of 1 g/kg synbiotic. Similarly, Ashayerzadeh et al. (2010) found the lowest serum cholesterol in birds fed diets containing synbiotics. These results might attribute to the decreased absorption or synthesis of cholesterol in the gastrointestinal tract through dietary probiotic supplementation (Mohan, 1996). Furthermore, reduced blood cholesterol was reported by Abdulrahim et al. (1996) when Lactobacillus acidophilus supplemented in the diet. It may help deconjugating bile salts in the intestine, and subsequently avoiding them to act as precursors in cholesterol synthesis.

**CONCLUSION**

The performance parameters of ostrich chicks affected by using graded levels of synbiotic and favorable results obtained by feeding 1g/kg synbiotic (Biomin IMBO). Serum cholesterol decreased using 1g/kg synbiotic but glucose increased by the addition of 1.5 g/kg.

**REFERENCES**


