ORAL SUPPLEMENTATION OF PUTRESCINE AND L-GLUTAMINE ON THE GROWTH PERFORMANCE, IMMUNITY, INTESTINAL ENZYMES IN THE BROILER CHICKENS

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ABSTRACT

Day old broiler chicks (150 Nos) were randomly allotted to five treatment groups with three replicates of ten chicks each and reared up to 42 d for assessing the effect of putrescine and L-glutamine supplementation on the intestine development. Putrescine and L-glutamine were orally supplemented at 0%(T1), putrescine 0.05%(T2), putrescine 0.1% (T3 ), L-glutamine 0.5%(T4), and L-glutamine 1%(T5) from day 1 to 7 after hatch. The 0.5% glutamine administration increased the body weight significantly (P<0.05) at the end of 42 day. However, the feed efficiency among the different treatment groups not changed at sixth week. The immune response of the broiler chicks was assessed on 28th and 35th d by injecting 1 ml of 0.25% sheep red blood cells (SRBC) in thigh and breast muscle on 14th and 21st d of age. Immunity against SRBC was not influenced by the oral feeding of putrescine and L-glutamine. The jejunal and ileal pH was significantly (P<0.05) reduced at 14 d of age and trypsic activity (P<0.05) was higher both at 2 and 3 weeks of age in all the treatment groups compared to control. Lipase activity was not influenced by putrescine and L-glutamine. Disaccharidases activity was higher in L-glutamine fed groups than other groups. It could be concluded that oral supplementation of putrescine and L-glutamine promoted the gut enzymes and thus increased the body weight in broiler chickens.

Key words: Putrescine, L-glutamine, broiler chicken, growth, immunity, gut development

Enhancing broiler chick intestine development especially during the first week after hatch has significant influence on the final body weight. Research studies have suggested that GI tract development in chicks could be accelerated by feeding different substrates soon after hatching (Murakami et al., 2007). The substrates like putrescine, a diamine, is a growth factor for the gut (Ginty et al., 1989) and L-glutamine is a vehicle in important metabolic pathways of the enterocyte mucosal structure (Smith, 1990) and maintains a barrier against bacterial attacks (Khan et al., 1999) and is also a vital energy substance for cells that divide rapidly like intestinal epithelium (Newsholme, 2001). Hence the present study was undertaken to assess the efficacy of feeding putrescine and L-glutamine on early gut development, and also to ascertain the level of oral supplementation in broiler chickens.

Day-old straight run broiler chicks (150 No) were weighed, wing banded and randomly allotted
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To five treatment groups with three replicates of ten chicks each and were reared in cages up to 42 d of age. The experimental diet was formulated to meet Bureau of Indian Standards (BIS, 1992). The birds were fed standard diets and putrescine (1,4 diaminobutane) and L-glutamine (Sigma Aldrich, USA) were orally administered during first seven days of chicks' age at following levels (% diet). Control (T1), 0.05% putrescine (T2), 0.1% putrescine (T3), 0.5% L-glutamine (T4) and 1% L-glutamine (T5). Broiler pre-starter, starter and finisher diets were fed ad libitum to the birds from 1-12, 13-22 and 23-42 d of age respectively. Body weight and feed intake were recorded every week to calculate the weight gain and feed conversion ratio (FCR). Immune response of the birds against sheep red blood cells (SRBC) was assessed by injecting 1 ml of 25% SRBC in the thigh and breast muscles on 14th d and a booster injection on 21st d of age. Blood samples were collected on 28th and 35th d of age from wing vein to assess the HA titre (Abdel-Ati and Latshaw, 1984).

At the end of 14th and 21st d of age, six birds were slaughtered from each group by decapitation. Intestinal contents were collected from duodenum, jejunum and ileum separately for estimation of intestinal pH, lipase (Boutwell, 1962), trypsin (Hawk et al., 1947) and disaccharidases activity (Dahlquist, 1964). The birds remaining in each treatment group were slaughtered at 42 d of age. The data collected were statistically analysed by completely randomized block design as per the method of Snedecor and Cochran (1994).

The mean body weight (g) recorded at the end of 42 d age in T4 group was significantly (P<0.05) higher than T3, T5 and control. This finding concurs with Sousadias and Smith (1995) and Yi et al (2005) who reported better body weight in broilers fed putrescine and L-glutamine at 1% level. However, Maiorka et al (2005) found no effect on supplementing 1% glutamine, and 0.05 and 0.1 % putrescine in the diet on the body weight in broilers. The mean FCR (Table) did not vary significantly among the treatment groups. This observation of the present study concurs with Sakamoto et al (2006) who reported that supplementing 1% L-glutamine and 0.01 and 0.1 % putrescine had no effect on the FCR at any developmental phase of broiler chickens. However, Yi et al (2005) reported that supplementation of 1% glutamine in the broiler diet up to 28 d of age had better feed efficiency than non-supplemented groups.

The antibody titre against SRBC in the treatment groups did not show any variation after primary and booster injections of SRBC. The observations of present study differs with Bartell and Batal (2007) who suggested that supplementation of glutamine (1%) and vitamin E (10 mg/Kg) in the feed promoted a better immune response than unsupplemented broiler chickens.

The mean pH of jejunum was significantly (P<0.05) lower in T2 groups compared to control during second week. Similarly, there was a significant (P<0.05) reduction in jejunal pH in T4 and T5 compared to T2 group at third week of age. The ileal pH was significantly (P<0.05) reduced in all the treatment groups compared to control at 2nd and 3rd week of age. The group T3 had significantly (P<0.05) lower pH than other groups. However, the duodenal pH was not affected both at 2nd and 3rd of age (data not shown). The reduction in pH might have favored better utilization of dry matter and nitrogen by lowering the bacterial count (Rama Rao et al., 2004). Tryptic activity was higher in all the treatment groups (P<0.05) during 2nd and 3rd week of age compared to control. Since the literature on the role of polyamines in chick's intestinal enzyme activity was scarce, the result was correlated with rats. Deloyer et al (2001) also indicated that early...
<table>
<thead>
<tr>
<th>Exp.</th>
<th>6th week body weight (g)</th>
<th>FCR at 42 d of age</th>
<th>Jejunal pH</th>
<th>Ileal pH</th>
<th>Trypsin (U/ml)</th>
<th>Disaccharidase (U/ml)</th>
<th>Lipase (U/ml)</th>
<th>Immune status (log2 titre)</th>
<th>Day-26</th>
<th>Day-35</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>207b ±41.8</td>
<td>1.76 ±0.08</td>
<td>6.66a ±0.09</td>
<td>5.83b</td>
<td>6.42b</td>
<td>6.31f</td>
<td>83.33f</td>
<td>156.67f</td>
<td>4.70f</td>
<td>2.92</td>
</tr>
<tr>
<td>T2</td>
<td>220f ±38.9</td>
<td>1.77 ±0.02</td>
<td>5.87</td>
<td>5.95b</td>
<td>5.90f</td>
<td>5.98b</td>
<td>116.68f</td>
<td>200.00f</td>
<td>2.48c</td>
<td>2.71</td>
</tr>
<tr>
<td>T3</td>
<td>2178b ±500</td>
<td>1.74 ±0.04</td>
<td>6.08bc</td>
<td>5.70b</td>
<td>5.80f</td>
<td>5.11b</td>
<td>108.33f</td>
<td>226.67f</td>
<td>3.85f</td>
<td>2.75</td>
</tr>
<tr>
<td>T4</td>
<td>2328b ±313</td>
<td>1.75 ±0.03</td>
<td>6.44b</td>
<td>5.66f</td>
<td>5.89f</td>
<td>5.92f</td>
<td>133.33f</td>
<td>176.67f</td>
<td>4.59f</td>
<td>3.57</td>
</tr>
<tr>
<td>T5</td>
<td>2190b ±42.1</td>
<td>1.77 ±0.02</td>
<td>6.25f</td>
<td>5.64f</td>
<td>5.67f</td>
<td>6.00f</td>
<td>108.33f</td>
<td>196.67f</td>
<td>5.88f</td>
<td>3.88</td>
</tr>
</tbody>
</table>

Each value is the mean of six observations
Means bearing a different lower case (P< 0.05) and upper case (P< 0.01) superscripts in a column differ significantly
differentiation and precocious maturation of pancreatic acinar cells increased the tryptic activity in rats fed spermine. The disaccharidases activity was significantly (P<0.05) higher in L-glutamine fed groups (T₄ and T₅) during 2nd week of age. The lipase activity was not influenced both at 2nd and 3rd week of age. However, Wild et al (1993) reported that polyamine administered to suckling rats induced disaccharidases activity.

From the above findings, it could be concluded that orally administered putrescine (0.05%) and L-glutamine (0.5%) for the first seven days of chick age increased body weight and improved gut health in broiler chickens.

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REFERENCES


