ILEAL ENERGY AND PROTEIN DIGESTIBILITY IN BROILER DIETS CONTAINING POULTRY BY-PRODUCT MEAL FROM IRAN

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Abstract
In order to study the energy and protein digestibility in broiler diets containing poultry by-product meal (PBPM), four experimental diets were formulated. First one was control with no PBPM. The other diets were 3.0, 6.0 and 9.0% PBPM supplementation, respectively. Cromic oxide was included at 0.4 percent in all diets as indigestible marker. Two hundred forty-Ross-308 as hatched broiler chickens fed experimental diets from 12 to 49 days of age. The birds were assigned randomly to four treatment groups as completely randomized design (per treatment/5 cold battery pen each fifteen bird). The ileal digesta were collected from one bird each pen on day 35. The birds were killed by intracardial injection of ketamin. Chicks were weighted individually and feed intake for each pen measured weekly during 7-wk experimental period. The CP digestibility values did not showed significant difference among control and diets containing PBPM. Low energy digestibility was found for control diet with no PBPM (P<0.05). The diets containing PBPM have shown relatively high energy digestibility so that it reach 0.773 in diet with 6% of PBPM. Generally, inclusion of 6 and 9 percent PBMP in diets decreased feed intake and growth performance. However, Good values of feed conversion ratio were found using PBMP in broiler diets.

Keywords: Poultry by product meal, ileal digestibility, broiler chicken

Introduction
Poultry by-product meal (PBPM) has a proper profile of available essential amino acids and is rich in calcium, phosphorus and vitamin B12 (NRC 1994). Recently, production of (PBPM) has been increased in northwest of Iran, East Azerbaijan state. The chemical composition and mineral content of this product differed relatively from other ones (Janmohammadi, 2009). The product had 20-25 percentage of crude fat and its crude protein content vary between 40-65 percent. In our country, fish meal is common ingredient as animal protein source in poultry diets. But, the country is poor source of high quality fish meal and it is imported at high cost. In recent years, the attention have been paid to PBPM supplementation in diets by poultry feed industry. But there are not sufficient data on its nutritive value especially in its nutrient digestibility. Many poultry nutritionist focused on digestibility trials in poultry at ileal level rather than excreta one (Applegate et al 2004). Ileal digestibility can give accurate digestibility data due to eliminating hind gut micro flora effects. Therefore, the present study was conducted to determine growth performance and ileal digestibility of energy and crude protein in practical broilers diets containing different levels of PBPM.

Materials and Methods
Two hundred forty-Ross-308 as hatched broiler chickens was used in this experiment. Four different experimental diets were formulated in the study. First one was control with no PBPM, the other diets were 3.0, 6.0 and 9.0% PBPM supplementation. Cromic oxide was included at 0.4 percent in all diets as indigestible marker. Experimental diets were formulated using common poultry feed ingredient in the country to meet or exceeded all nutritional specification of grower and finisher broiler chicken (Ross308 management guide manual). The diets fed to chicks from 12 to 49 days of age. The birds were assigned randomly to four treatment groups as completely randomized design (per treatment/5 cold battery pen each fifteen bird). The birds were housed in triple stair cage at Khalatpooshan Poultry Research Unit of the University of Tabriz. Continuous lighting and feed and water ad libitum were provided throughout the experiment. Vaccination program was followed according to the local general veterinary office. The ileal digesta were collected from one bird of each pen on day 35 The birds were killed by intracardial injection of ketamin. When the birds were completely immobilized, the body
cavity was opened, the ileum removed and digesta gently flushed from ileum using distilled water from a 50 ml syringe into labeled plastic containers. The ileum is defined as that portion of the small intestine extending from the vitelline diverticulum to a point 40 mm proximal to ileo-cecal junction. The collected digesta from five birds from each dietary treatment were pooled, immediately stored at -20 centigrade degree. The digesta samples were subsequently oven dried (at 70 centigrade degree), finely ground and stored at -20 centigrade degree whilst awaiting chemical analysis. The ground samples of digesta and diets were subjected to CP analysis by 2300 Kjeltec, Foss Tecator instruments and Gross energy (GE) by Parr adiabatic calorimeter bomb. Chromic oxide content of diets and the digesta was measured by spectrophotometry method as reported by Fenton and Fenton (1979). Chicks were weighted individually and feed intake for each pen measured weekly during 7-wk experimental period. Cumulative weight gain and feed intake were calculated along with weekly and cumulative feed conversion ratio. The CP and GE outputs in ileal digesta were calculated using the following formula:

\[
\text{CP/GE} = \frac{\text{CP/GE concentration in digesta} \times \text{CP/GE concentration in diet}}{\text{diesta Cr2O3 concentration (mg/kg)}}
\]

CP/GE outputs are as mg/Cal /kg DM intake)

Apparent ileal CP and GE digestibility in experimental diets was calculated using the following equation (Kadim and Mougham, 1997):

\[
\text{Apparent ileal CP/GE digestibility} = \frac{\text{CP/GE concentration in diet} - \text{CP/GE output in ileum} \times 100}{\text{CP/GE concentration in diet}}
\]

The data was analyzed in a completely randomized design using GLM procedure of SAS. Comparison of means was conducted by Duncan’s multiple range tests.

**Results**

The effects of PBPM inclusion at different levels in broiler chicken diets on various growth performances and CP and GE digestibility are shown in Table 1. The CP digestibility values did not showed significant difference among control and diets containing PBPM. Generally, the values were high and varied from 0.835 to 0.846. In contrast, Energy digestibility values showed significant differences (P<0.05) among experimental diets. Low energy digestibility was for control diet with no PBPM. The diets containing PBPM have shown relatively high energy digestibility so that it reached 0.773 in diet with 6% of PBPM. Feed intake, weight gain and body weight at 49 days of age were affected significantly (P<0.05) with inclusion of PBPM in broiler chicken diets. Generally, including 6 and 9 percent PBMP in diets decreased these growth data. However, Feed conversion ratio (FCR) did not negatively affected by being PBMP in the diets.

**Discussion**

Generally, nutrient digestibility in boiler chicken diet contain PBPM were high. The product has high fat which is rich of unsaturated fatty acids and this may be responsible for high energy digestibility values, especially. High digestibility of unsaturated fatty acid has been already proved well (Lesson. and Summers, 2001). High CP digestibility values which obtained here is generally agreement with Ileal CP digestibility for poultry (Lesson and Summers, 2001). However, Iskia et al (2006) reported that inclusion of broiler offal meal (contained 23.3 and 55.5 % EE and CP respectively) at 3 % of boiler chicken diet decreased significantly CP digestibility in comparison to control diet with no broiler offal meal. Although, broiler offal meal has similar fat and CP values to the PBPM at present study, but it should be noted that its CP digestibility was measured at excreta level in total gastrointestinal tract not like the present study at ileal level. Generally, total gastrointestinal tract digestibility values are lower than that in ileal level. Decreasing feed intake with increasing PBPM in diets may be due to increasing concentration of metabolizable energy content in these diets. This is supported by GE energy digestibility data which are 7-8 % more than that control diet (table 1). Impairment of weight gain and final body weight resulted from decreasing feed intake in diets containing PBPM. However, feed conversion ratio values in all diets are comparable with the corresponding value in management guide and inclusion of PBPM supported feed efficiency. Although, increasing concentration of metabolizable energy content in diets containing PBMP decreased feed intake but it has proper effect on utilization of energy. It is shown that high energy diet had generally high feed efficiency (Lesson. and Summers, 2001) This finding for PBPM may be valuable for poultry industry of Iran which is poor in supplying high quality protein source.
Table 1. The effects of PBPM inclusion at different levels in broiler diets on nutrient digestibility and growth performance

<table>
<thead>
<tr>
<th>Diets</th>
<th>CP Digestibility</th>
<th>GE Digestibility</th>
<th>Feed Intake (gr)</th>
<th>12-49 days of age</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Body Weight (gr)</td>
</tr>
<tr>
<td>Control</td>
<td>0.835</td>
<td>0.697b</td>
<td>4037a</td>
<td>2281a</td>
</tr>
<tr>
<td>3%</td>
<td>0.845</td>
<td>0.735ab</td>
<td>3875a</td>
<td>2201b</td>
</tr>
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<td>6%</td>
<td>0.864</td>
<td>0.773a</td>
<td>3785b</td>
<td>2134b</td>
</tr>
<tr>
<td>9%</td>
<td>0.846</td>
<td>0.767a</td>
<td>3629c</td>
<td>1984c</td>
</tr>
<tr>
<td>SEM</td>
<td>0.0057</td>
<td>0.009</td>
<td>44.2</td>
<td>22.7</td>
</tr>
</tbody>
</table>

In the same column differently superscripted are significantly (P<0.05) different.

References


