Dietary Valine Supplementation on Meat Quality Characteristics of Broilers*

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Abstract

Biological trial was conducted by using two hundred commercial (Vencob), sexed, day-old broiler chicks for a period of six weeks to study the dietary supplementation of valine with respect to meat quality characteristics. Chicks were randomly grouped into five treatments with four replicates of ten chicks each and fed with basal diet as T₁ (Control), T₂ (Basal diet + 0.04 per cent valine), T₃ (Basal diet + 0.08 per cent valine), T₄ (Basal diet + 0.12 per cent valine) and T₅ (Basal diet + 0.16 per cent valine). The experimental feed was formulated according to the Vencobb standards by supplementing graded levels of valine for different treatment groups. Results of the study indicated that the dietary valine supplementation had no significant effect on carcass characteristics viz. pre-slaughter weight and heart percentage at sixth week of age. However, the T₅ group birds revealed significant (P < 0.01) difference for eviscerated percentage, ready-to-cook percentage, liver percentage, gizzard percentage and giblets percentage. The abdominal fat weight of broilers showed non significant difference among treatment groups. The breast and thigh muscle moisture of broilers revealed no significant difference between treatment groups. The breast and thigh muscle protein were significantly (P < 0.01) higher in T₅ group. Likewise, the breast and thigh muscle cholesterol levels were significantly (P < 0.01) lower in T₅ group at sixth week. Based upon this study, it is concluded that supplementation of valine in broiler basal diet at the level of 0.04 per cent significantly improved the breast and thigh muscle protein level and lowered the breast and thigh muscle cholesterol level of broiler meat in a cost effective way.

Key words: Valine, Broiler ration, Meat quality

Rapid growth of broiler chicken demands high level of well balanced nutrients in the ration, especially with amino acids for marketing at an earlier age. These amino acids play an important role in structural and protective tissues in the body and are also important in enzyme and tissue functions (N.R.C 1994). Amino acids might also impact the muscle composition and the meat quality and more over final product stability. The amino acid, valine cannot be synthesized in the body and is required to be supplemented in the diet. The availability of L-valine offers a new opportunity to formulate more efficient diet through the optimization of the ideal amino acid profile thereby reduces the dietary crude protein content and as a consequence to reduce nitrogen excretion from the birds to the environment. Hence, this research programme has been designed to study the carcass characteristics of broilers by including graded levels of valine in the ration and also to assess the protein and cholesterol level in the broiler meat.

Materials and Methods

The biological trial was conducted by using two hundred commercial (Vencob), sexed, day-old broiler chicks belonging to single hatch. These chicks were wing banded, weighed and randomly grouped into five treatments with four replicates of ten chicks each and fed with basal diet as T₁ (Control), T₂ (Basal diet + 0.04 per cent valine), T₃ (Basal diet + 0.08 per cent valine), T₄ (Basal diet + 0.12 per cent valine) and T₅ (Basal diet + 0.16 per cent valine). The experimental feed was formulated according to the Vencobb standards by supplementing

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Table I. Mean (± S.E.) carcass characteristics of broilers at 6 weeks of age as influenced by dietary supplementation of valine

<table>
<thead>
<tr>
<th>Treatment groups</th>
<th>Pre-slaughter weight (g)</th>
<th>Eviscerated percentage</th>
<th>Ready-to-cook percentage</th>
<th>Heart percentage</th>
<th>Liver percentage</th>
<th>Gizzard percentage</th>
<th>Giblets percentage</th>
<th>Abdominal fat weight (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T₁ - B diet</td>
<td>2340.75 ± 95.00</td>
<td>67.60± 0.54</td>
<td>71.92± 0.54</td>
<td>0.44± 0.02</td>
<td>1.83± 0.06</td>
<td>1.96± 0.08</td>
<td>4.23± 0.15</td>
<td>27.88 ± 3.03</td>
</tr>
<tr>
<td>T₂ - B+0.04</td>
<td>2344.75 ± 84.93</td>
<td>74.90± 0.58</td>
<td>79.10± 0.82</td>
<td>0.53± 0.06</td>
<td>2.17± 0.11</td>
<td>2.08± 0.10</td>
<td>4.69± 0.20</td>
<td>35.31 ± 2.98</td>
</tr>
<tr>
<td>T₃ - B+0.08</td>
<td>2360.87 ± 81.57</td>
<td>74.90± 0.55</td>
<td>78.39± 0.49</td>
<td>0.48± 0.02</td>
<td>1.90± 0.07</td>
<td>1.54± 0.05</td>
<td>3.92± 0.10</td>
<td>32.38 ± 4.63</td>
</tr>
<tr>
<td>T₄ - B+0.12</td>
<td>2298.56 ± 79.38</td>
<td>73.67± 0.49</td>
<td>79.10± 1.52</td>
<td>0.43± 0.01</td>
<td>1.85± 0.08</td>
<td>1.73± 0.12</td>
<td>3.62± 0.14</td>
<td>26.06 ± 2.62</td>
</tr>
<tr>
<td>T₅ - B+0.16</td>
<td>2422.87 ± 114.70</td>
<td>74.77± 0.40</td>
<td>78.74± 0.46</td>
<td>0.45± 0.04</td>
<td>1.92± 0.08</td>
<td>1.61± 0.09</td>
<td>3.98± 0.13</td>
<td>32.25 ± 3.34</td>
</tr>
</tbody>
</table>

Value given in each cell is the mean of eight observations. A and B Means within a column with no common superscript differ significantly (P < 0.01)

graded levels of valine for different treatment groups. All chicks were reared up to 6 weeks in deep litter system in open sided broiler house under standard managemental conditions throughout the experimental period. At the end of the experiment (42nd day), four males and four females, totally eight birds per treatment group were randomly picked up and slaughtered. The pre-slaughter weight, eviscerated carcass weight, giblets weight, ready-to-cook carcass percentage and abdominal fat weight were recorded. The thigh and breast muscle samples were collected from each carcass and stored at -20°C for estimation of muscle protein (A.O.A.C., 2002) and cholesterol (Wybenga et al., 1970).

Results and Discussion

The mean (± S.E.) carcass characteristics of broilers as influenced by dietary supplementation of valine at 6 weeks of age are presented in Table I.

The carcass characteristics viz. pre-slaughter weight and heart percentage at sixth week of age in broilers did not differ significantly due to dietary supplementation of valine. Statistical analysis of data on eviscerated percentage showed significant difference (P < 0.01) among the treatment groups. The groups T₂ and T₃ recorded higher eviscerated percentage which differ significantly from T₁ followed by T₄ and T₅ groups which did not differ significantly among them. Similarly, the groups T₂ and T₃ recorded significantly (P<0.01) the highest ready-to-cook percentage followed by T₅ and T₄ and the lower ready-to-cook percentage was recorded in T₁ group. This is in accordance with the findings of Leclercq (1998), Mack et al. (1999), Corzio et al. (2004), Thornton et al. (2006) and Dozier et al. (2011) who reported that maximum carcass yield was achieved due to dietary supplementation of valine. Contrary to the findings recorded in this study, Leitgeb et al. (2004) have observed no effect on slaughter performance due to dietary valine supplementation.

Significantly (P<0.01) higher liver percentage was recorded in T₂ followed by T₄ and T₅, which did not differ significantly from T₁ and T₂ groups. The highest (P < 0.01) gizzard percentage was recorded in T₂ followed by T₄ and T₂ groups. Similarly, the highest giblets percentage was recorded in T₂ followed by T₁ which differ significantly from T₅ and T₂ groups and the lowest was recorded in T₄ groups at sixth week. Analysis of data on mean abdominal fat weight did not differ significantly between treat-
ment groups at sixth week of age. The result is in accordance with the findings of Leclercq (loc. cit), Mack et al. (loc.cit), Corzo et al. (loc.cit) and Corzo et al. (2011) who recorded that optimum abdominal fat content was due to supplementation of valine. Contrary to the findings recorded in this study, Thornton et al. (loc.cit) recorded reduced abdominal fat content due to dietary supplementation of valine.

The mean (± S.E.) breast and thigh muscle moisture content (%), protein content (%) and cholesterol content (mg %) of broilers as influenced by dietary supplementation of valine at 6 weeks of age are presented in Table II.

The mean breast and thigh muscle moisture of broilers did not differ significantly between treatment groups. The significantly (P < 0.01) highest breast muscle protein was recorded in T₁ followed by T₀ and lowest breast muscle protein was recorded in T₀. Similarly, significantly (P < 0.01) highest thigh muscle protein was recorded in T₁ followed by T₀ and the lowest thigh muscle protein was recorded in T₄ group at sixth week. The results in the study concur with the findings of Baker et al. (1996), Bae et al. (1999) and Jianlin et al. (2004) who observed numerical increase in muscle protein content (58.40 per cent) in 0.21 per cent valine supplemented, 20.55 per cent crude protein diet.

Both breast and thigh muscle cholesterol was significantly (P < 0.01) the lowest in T₂ group and significantly higher in 0.12 per cent valine supplemented group (T₀) group at sixth week. The treatment groups T₀, T₁, T₂ and T₃ did not differ significantly among them and there is no significant difference between T₀, T₁ and T₂ groups. These results were in accordance with Han et al. (1992) who observed that 0.22 per cent L-valine in broiler diet significantly (P < 0.05) decreased body fat.

**Summary**

Based upon this study, it is concluded that supplementation of valine in broiler basal diet at the level of 0.04 per cent significantly improved the breast and thigh muscle protein level and lowered the breast and thigh muscle cholesterol level of broiler meat in a cost effective way.

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**References**


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DOYEN OF INDIAN VETERINARY PROFESSION

Dr. C. Krishna Rao passed away on 9-12-2015 at Hyderabad. Dr. C. Krishna Rao was born on 13-7-1920 at Kakinada. He obtained his B.V.Sc from Madras Veterinary College (1943) and MS from California University (1947). He is first veterinarian to obtain doctorate from an Indian university and obtained Ph.D from Madras University (1954). He was the first person from A.P. to become Animal Husbandry Commissioner, Government of India (1969-74) and youngest AHC,GOI. He is the first veterinarian to become Vice-Chancellor of any Agricultural university in India. He was V.. chancellor, APAS (1.9.1974 to 6.11.1978). He was also an honorary Dean of Veterinary Faculty, APAS (6.6.1968 to 6.5.1969). He served as Principal (FAC) College of Veterinary Science, Tirupati (15-4-1956 to 15-8-1956) in the capacity of Deputy Director, Animal Husbandry and as Member Board of Management ANGRAU (1967-68), Chairman and Managing Director, A.P. State Meat and Poultry development corporation(1979) and Managing director, A.P. Dairy development corporation (1975), Director, Animal Husbandry, A.P. (November 1965 to April 1969), Assam (1962-1965) and Mizoram, President, A.P. Veterinary Association, President, Indian Veterinary Association for four terms for 13 years and Executive Member, Veterinary Council of India. He was consultant of ADB and USAID. He travelled 15 countries and was awarded honorary degree of D.Sc by three universities.

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