Abstract

A feeding trial was conducted to find out the effect of inclusion of toasted guar meal with or without β-mannanase enzyme and also raw guar meal as an alternative protein source in broiler ration. For the trial, 480 day-old Cobb 400 broiler chicks were divided into ten groups (with six replicates and each containing eight birds) and were fed isonitrogenous and isocaloric diets containing 2, 4 and 6 per cent toasted guar meal with or without β-mannanase enzyme and raw guar meal. The overall body weight gain (1737-1845 g vs 1769 g), feed intake (3417-3567 g vs 3427 g) and feed efficiency (1.908-2.043 vs 1.946) from 0 - 6 weeks were comparable at all the three levels of toasted guar meal with or without β-mannanase enzyme and raw guar meal. The results indicated that broiler birds fed with different levels of toasted guar meal with or without β-mannanase enzyme or raw guar meal had comparable body weight gain, feed intake and feed efficiency.

Key words: Broiler, Raw, Toasted guar meal, Performance.

Guar is a multi-purpose crop and used for extracting gum from seeds, the vegetative part is used as animal fodder or green manure. The guar seed is made up (%) of hull 13-18, germ 41-46 and endosperm 34-43.

The crude protein (CP) of guar meal (GM) as reported by various authors varied from 38.78 to 52.70 (Muthukumar and Nidhina, 2015) vs 44.0 per cent in soyabean meal. The crude fibre of guar meal varied from 4.9-12.55 vs 7.0 per cent. The unit (g) price of soyabean and guar meal protein is 9.3 (42/kg for 450 g of protein) and 6.15 (29.5/kg for 480 g of protein) paise, respectively. Even a 1 per cent replacement of soya bean protein with guar meal protein will result in savings of `315 / tonne of broiler feed. The anti-nutritional factors such as galactomannan, trypsin inhibitors etc. present in guar meal is limiting its usage at high levels in broiler diets.

Therefore an experiment was conducted to study the production performance of inclusion of toasted guar meal with or without β-mannanase enzyme and also raw guar meal as an alternative protein source in broiler chicken ration.

Materials and Methods

The experimental broiler pre starter, starter and finisher diets were formulated by inclusion of raw or toasted guar meal (see Table I for chemical composition) at varying levels (0, 2, 4 and 6%). The three levels of toasted guar meal diets were supplemented with β-mannanase enzyme containing 800000 U/g of mannanase.

The diets were formulated to have same levels of AME, protein, lysine and methionine within the type of diet. The various experimental groups were as follows.

T1  Standard broiler diet (Control)
T2  2% toasted guar meal
T3  4% toasted guar meal
T4  6% toasted guar meal
T5  2% toasted guar meal with β-mannanase enzyme
T6  4% toasted guar meal with β-mannanase enzyme
T7  6% toasted guar meal with β-mannanase enzyme

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The pre-starter, starter and finisher diets were fed to birds from 1 to 14, 15 to 28 and 29 to 42 days of age, respectively.

The biological experiment was conducted with four hundred and eighty day old-broiler Cobb 400 straight run chicks. The chicks were wing banded and weighed individually, assigned randomly to ten experimental groups with six replicates and eight chicks per replicate. Completely randomized design was followed. The birds were housed in deep litter pens and reared under uniform standard managemental practices. The chicks were fed with weighed quantity of experimental diets (feed is offered at adlibitum) and had free access to water. Individual body weight and replicate feed intake were recorded at weekly intervals and weight gain and feed conversion ratio (FCR) were worked out. Mortality, if any, was recorded. The data collected on various parameters were statistically analysed as per the method of Snedecor and Cochran (1989) and the means of different experimental groups were tested for statistical significance by Duncan’s multiple range test (Duncan, 1955).

**Results and Discussion**

The observations of body weight gain, feed intake and feed efficiency of the broiler trial at different age are presented in the Table II.

Incorporation of raw and toasted guar meal with or without β-mannanase enzyme up to 6 per cent level had no significant effect over the control diet in terms of body weight gain during the pre-starter, starter, finisher and entire period (0 – 42 days). Similarly, Patel and McGinnis (loc. cit) observed that autoclaved and toasted guar meal can be included in broiler diets without any harmful effect on growth performance respectively. Patel and McGinnis (loc. cit) had indicated that addition of hemicellulase and multi enzyme enhanced the inclusion

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**Table I.** Proximate composition and calcium and phosphorus (in %), water holding capacity and urease activity of raw/toasted guar meal (on as such basis)

<table>
<thead>
<tr>
<th>Composition</th>
<th>Guar meal*</th>
<th>Minimum value</th>
<th>Maximum value</th>
<th>Raw guar meal**</th>
<th>Toasted guar meal**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry matter</td>
<td>91.68 ± 0.27</td>
<td>90.62</td>
<td>92.97</td>
<td>92.03</td>
<td>90.1</td>
</tr>
<tr>
<td>Crude protein</td>
<td>48.61 ± 1.21</td>
<td>43.74</td>
<td>53.56</td>
<td>46.98</td>
<td>49.59</td>
</tr>
<tr>
<td>Crude fibre</td>
<td>6.88 ± 0.85</td>
<td>3.59</td>
<td>9.95</td>
<td>5.9</td>
<td>6.5</td>
</tr>
<tr>
<td>Ether extract</td>
<td>6.31 ± 0.22</td>
<td>5.1</td>
<td>6.88</td>
<td>6.4</td>
<td>6.7</td>
</tr>
<tr>
<td>Total ash</td>
<td>6.33 ± 0.60</td>
<td>4.77</td>
<td>8.91</td>
<td>6.9</td>
<td>7.4</td>
</tr>
<tr>
<td>Calcium</td>
<td>0.50 ± 0.09</td>
<td>0.35</td>
<td>1.05</td>
<td>0.54</td>
<td>0.55</td>
</tr>
<tr>
<td>Total phosphorus</td>
<td>0.74 ± 0.07</td>
<td>0.6</td>
<td>1.04</td>
<td>0.63</td>
<td>0.67</td>
</tr>
<tr>
<td>Water holding capacity (g H₂O/g sample)</td>
<td>2.61 ± 0.07</td>
<td>2.33</td>
<td>2.97</td>
<td>2.92</td>
<td>2.63</td>
</tr>
<tr>
<td>Urease activity (g/min)</td>
<td>0.002 ± 0.003</td>
<td>0.001</td>
<td>0.004</td>
<td>0.002</td>
<td>0.003</td>
</tr>
</tbody>
</table>

*Each value is the mean of seven samples obtained from the market which may be raw or toasted sample obtained from the market

**Test samples
of processed guar meal in the broiler diet from 10 per cent to 15 per cent level. Patel and McGinnis (1983) and Gharai et al. (2012) reported that the raw guar meal up to 10 per cent level can be included in the diet without affecting weight gain. But, growth depression at 5 per cent (Lee et al., 2005) and 4 per cent (Larhang and Torki, 2011) inclusion of raw guar meal was observed in broilers.

Inclusion of 2, 4 and 6 per cent of toasted guar meal with or without β-mannanase enzyme and raw guar meal during starter, finisher and overall growth period had no significant effect in feed intake over the control diet. Raw guar meal up to 6 percent also did not influence the feed intake. In the pre starter period, increased feed intake was observed in birds fed diets containing 4 per cent toasted guar meal with and without β-mannanase enzyme and 6 per cent toasted guar meal with β-mannanase enzyme. The increase in feed intake in 4 per cent toasted guar meal and comparable feed intake in 6 per cent toasted guar meal when compared to the control suggested that higher level of toasted guar meal suppress feed intake. However, addition of β-mannanase enzyme in 6 percent toasted guar meal was found to enhance the feed intake. Similarly, Tyagi et al. (2011) also reported comparable feed intake by feeding toasted guar meal up to 15 per cent and 10 per cent. Similarly, Tyagi et al. (loc. cit) also reported that application of enzymes in processed guar meal using multi enzymes in 15 per cent toasted guar meal and inclusion of β-mannanase enzyme in 5 per cent roasted guar meal diet and no influence of feed intake due to addition of enzymes. But, Kamran et al. (2002) recorded that β-mannanase enzyme reduces feed intake at 10 and 15 per cent of guar meal included in broiler diet. In accordance with observations of comparable feed intake with the use of raw guar meal up to 6 per cent in the present study, Gharai et al. (loc. cit) and Hassan et al. (2013) also observed that raw guar meal can be included up to 9 per cent without any adverse effect. However, Kamran et al. (2002) and Larhang and Torki (loc. cit) have reported reduced feed intake when raw guar meal was used at 10 and 4 per cent levels, respectively.

Feed efficiency was not influenced by the incorporation of raw and toasted guar meal with or without β-mannanase enzyme when
compared to the control diet. The poor feed efficiency may be due to numerically higher feed intake without any additional weight gain in that period. However in the others and overall experimental periods, the feed efficiency was comparable to the control. Patel and McGinnis (loc. cit) also observed comparable feed efficiency up to 15 per cent inclusion of autoclaved guar meal with or without hemicellulase enzyme and toasted guar meal with or without multi enzymes. Using raw guar meal, comparable feed efficiency was observed at 10 (Lee et al., loc. cit), 8 (Larhang, loc. cit), 9 (Gharaei et al., loc. cit) and 2.5 per cent (Hassan et al., loc. cit) inclusion as recorded in this study. While, Patel and McGinnis, (loc. cit) and Kamran et al. (loc. cit) reported poor feed efficiency at 15 per cent inclusion of raw guar meal.

Summary

Based on the overall performances such as body weight gain, feed intake and feed efficiency it can be concluded that toasted guar meal with or without β-mannanase enzyme or raw guar meal may be incorporated up to 6 per cent in the broiler diets.

References


Larhang, R. A and M.Torki. (2011) Evaluating Performan-


