EFFECT OF INCLUSION OF CORN GERM MEAL IN DIETS OF COLORED (RAJA-II) BROILERS WITH PHYTASE ENZYME SUPPLEMENTATION

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ABSTRACT
An experiment was conducted with an objective to study the growth performance of colored broiler chicken fed with corn germ meal (CGM) based diets and to access effect of supplementation of phytase enzyme in CGM based diets on production performance. Eight dietary treatments were prepared by partly replacing maize and soya bean meal (SBM) with 0, 15, 20 and 25% of CGM with and without phytase enzyme (conc. 2500 IU/g) supplementation at 0.05 percent. Body weight gain, feed intake FCR and livability were estimated for every week and also cumulatively. Cumulative body weight gain of birds ranged from 1369 to 1202 gm differing significantly (p<0.05) between 0% CGM groups without and with phytase supplementation but not in other groups. Feed consumption, FCR and livability were not differing significantly (p>0.05). The production performance in terms of both performance index scores (PIS) and economic index score (EIS) were ranging from 129.4 (0% CGM with phytase) to 162.5 (0% CGM without phytase) for PIS and 6.653 (25% CGM without phytase) to 8.687 (0% CGM without phytase) for EIS values. Results indicate that CGM can be included in the diets of colored broilers without or with phytase enzyme supplementation up to 25 percent level.

INTRODUCTION
Poultry feed accounts for about 60-70 percent of the total cost of production which is one of the most serious challenges for the industry. Cereal by-products and oilseed residues usually constitute about 50 percent of poultry diet. Corn germ meal (CGM) is a byproduct from corn industry obtained after extraction of corn oil and has nutritional characters (with medium energy and protein) for inclusion in poultry feeds (Loy and Wright, 2003). The proximate composition of the CGM is not constant and is changing depending on various factors like area of cultivation, method of oil extraction and variety of corn used etc. The proximate composition of full fat and defatted CGM reported by various researchers are presented in Table No. 1.

Brito et al. (2005) carried out two experiments to estimate the performance of broilers fed on increasing levels of corn germ meal (CGM) in the diets and recommended inclusion levels of CGM were 21.9 and 22.5 per cent from 8 to 21 days and from 22 to 38 days, respectively. Brunelli et al. (2006) conducted an experiment with increasing level of inclusion of defatted CGM in broiler diets up to 20 percent level and concluded that defatted CGM in broiler can be fed up to 20 percent level in broiler diets without affecting productive performance and carcass characteristics of birds. Brito et al. (2009) evaluated the performance and egg quality of laying hens in second production cycle (78 to 90 weeks) consuming corn germ by replacing corn in the diet. They recommend a level up to 25% of substitution of corn with corn germ which was 16% of corn germ in the total diet for laying hens in second production cycle.

The high crude fibre (CF) content and high phytate phosphorus content of CGM (Graf and Eaton, 1984) limits its use at higher levels in poultry diets. Phosphorus in phytate form interferes with nutritional value, reducing the bioavailability of other minerals, digestive enzymes and proteins of the ration, which affects the performance of birds when incorporated in poultry diets (Ravindran et al., 1999). Jadhav et al. (2011) conducted a study to evaluate the effect of phytase supplementation on growth and nutrient balance in chicken fed diets containing sunflower meal (SFM) as a partial replacement for SBM at two different levels of dicalcium phosphate (DCP) with or without exogenous phytase enzyme and concluded that 50 percent of DCP can be substituted by limestone with phytase incorporation without any adverse effects on growth and performance of broilers to make broiler feeding comparatively cheaper. Deepa et al. (2011) studied the effect of phytase and citric acid on growth performance, phosphorus, calcium and nitrogen retention in broilers fed with low levels of available phosphorus (Pav). The results revealed increase in weight gain and feed intake of broilers fed diets with phytase alone and also with phytase plus citric acid supplementation. Pacheco et al. (2012) studied the effect of phytic acid present in CGM on feed intake body weight, FCR and blood biochemistry in pigs and concluded that diets containing higher levels of phytic

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1581
Acid (with CGM as ingredient) did not affect the parameters studied. In this regard present work was planned to study the performance of colored broilers fed with different levels of CGM without and with phytase supplementation.

MATERIALS AND METHODS

One day old colored broiler (Raja-II) chicks were randomly distributed (n = 240) into eight treatment groups of 30 birds each (5 replications of 6 birds each). Two hundred and forty one day old colored broiler (Raja-II) chicks were randomly distributed into eight treatment groups of 30 birds each (5 replications of 6 birds each). The birds were reared on wire floor battery raised brooders of single tier system which were kept in well ventilated and hygienic house under standard management conditions. Chicks were vaccinated against Marek's disease at hatchery by subcutaneous route, New Castles Disease (NDV) on 7th day using F1 strain by ocular route and against IBD disease on 17th day through drinking water. The rest of manage mental practices like brooding, lighting, and other biosecurity measures were followed uniformly for all the birds during the 42 day experimental period. The expeller processed CGM was procured from Dharward, Karnataka and tested for the presence of aflatoxins which are potent hepatotoxic and immunotoxic factors in broiler feeds (Ramdas et al., 2013) at pristine laboratories, Bangalore. Proximate composition, calcium and phosphorus contents of feed ingredients included in the rations and composed treatment diets were analysed (AOAC, 2005) and presented in Table 2 and 3 respectively. As per NRC (1994) standards, practical basal diet comprising of maize, soybean meal was prepared afresh for each use and the dietary formulation was presented in Table III. Body weight gain, feed intake and FCR were calculated phase wise and also cumulatively. The data generated was subjected to statistical analysis (Snedecor and Cochran, 1989) by using two-way ANOVA procedure of SAS 9.1 portable software.

RESULTS AND DISCUSSION

The data pertaining to different parameters of broilers in different treatment groups during the experimental period is presented in Table 4. There was significant difference (p < 0.05) in body weight gain during pre starter stage, but no significant (p > 0.05) difference in body weight gain during starter, finisher phases and also cumulatively among treatment groups fed diets with different levels of CGM without phytase enzyme supplementation (T1, T2, T3 and T4). The body weight gain of birds in phytase enzyme supplemented groups with different levels of CGM (T5, T6, T7 and T8) found to be statistically similar (p > 0.05). Enzyme supplementation resulted in significant reduction (p < 0.05) in body weight gain in 0 percent CGM fed groups but in groups fed with CGM based diets. The reduction in body weight gain in T6 (0% CGM with phytase) group is may be due to the low level of available phosphorus as DCP in T6 (0% CGM without phytase) diet is replaced with LSP in T6, where as in treatment diets containing CGM in their diet the amount of phosphorus reduced by the replacement of DCP with LSP was supplied by the action of phytase enzyme on phytate phosphorus present in CGM resulting in non significance in body weight gain. Similar results were obtained by Brito et al. (2005) with respect to CGM level of inclusion in the diets. However, Brunelli et al. (2006) reported significant (p < 0.01) increase in weight gain of birds with increasing level of defatted CGM inclusion in the diets.

Table 1: Percent chemical composition of defatted and full fat CGM

<table>
<thead>
<tr>
<th>Reference</th>
<th>Type of CGM</th>
<th>DM</th>
<th>TA</th>
<th>CP</th>
<th>EE</th>
<th>CF</th>
<th>NDF</th>
<th>ADF</th>
<th>Ca</th>
<th>P</th>
<th>MEK Cal/Kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gupta et al., 1998</td>
<td>defatted</td>
<td>19.14</td>
<td>04.53</td>
<td>10.20</td>
<td>01.27</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2949</td>
</tr>
<tr>
<td>Moreira et al., 2002</td>
<td>defatted</td>
<td>89.67</td>
<td>03.90</td>
<td>12.40</td>
<td>01.60</td>
<td>-</td>
<td>37.60</td>
<td>07.30</td>
<td>-</td>
<td>-</td>
<td>3000</td>
</tr>
<tr>
<td>Mendes et al., 2006</td>
<td>defatted</td>
<td>89.44</td>
<td>06.44</td>
<td>09.81</td>
<td>00.60</td>
<td>03.29</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2413</td>
<td></td>
</tr>
<tr>
<td>Brunelli et al., 2006</td>
<td>defatted</td>
<td>88.03</td>
<td>07.35</td>
<td>10.79</td>
<td>00.20</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Beran et al., 2007</td>
<td>defatted</td>
<td>89.13</td>
<td>02.70</td>
<td>23.64</td>
<td>2.38</td>
<td>10.69</td>
<td>61.05</td>
<td>12.49</td>
<td>0.04</td>
<td>0.65</td>
<td>3350</td>
</tr>
<tr>
<td>Weber et al., 2010</td>
<td>defatted</td>
<td>88.28</td>
<td>02.62</td>
<td>10.13</td>
<td>09.96</td>
<td>02.18</td>
<td>30.25</td>
<td>09.09</td>
<td>0.02</td>
<td>0.43</td>
<td>2832</td>
</tr>
<tr>
<td>Anderson et al., 2012</td>
<td>defatted</td>
<td>90.00</td>
<td>01.87</td>
<td>11.48</td>
<td>49.48</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Brito et al., 2005</td>
<td>Full fat</td>
<td>10.88</td>
<td>03.92</td>
<td>10.14</td>
<td>09.32</td>
<td>05.14</td>
<td>-</td>
<td>-</td>
<td>0.02</td>
<td>0.07</td>
<td>-</td>
</tr>
<tr>
<td>Ramos et al., 2007</td>
<td>Full fat</td>
<td>88.28</td>
<td>02.62</td>
<td>10.13</td>
<td>09.96</td>
<td>02.18</td>
<td>30.25</td>
<td>09.09</td>
<td>0.02</td>
<td>0.43</td>
<td>2832</td>
</tr>
<tr>
<td>Calderano et al., 2010</td>
<td>Full fat</td>
<td>90.50</td>
<td>02.74</td>
<td>10.39</td>
<td>12.09</td>
<td>06.42</td>
<td>38.01</td>
<td>08.35</td>
<td>0.04</td>
<td>0.43</td>
<td>2832</td>
</tr>
<tr>
<td>Albuquerque et al., 2014</td>
<td>Full fat</td>
<td>96.39</td>
<td>01.87</td>
<td>11.48</td>
<td>49.48</td>
<td>-</td>
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</table>

Table 2: Chemical composition of feed ingredients (% DM basis)

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Moisture</th>
<th>CP</th>
<th>EE</th>
<th>CF</th>
<th>TA</th>
<th>NFE</th>
<th>Ca</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize</td>
<td>10.76</td>
<td>8.75</td>
<td>4.11</td>
<td>2.86</td>
<td>2.08</td>
<td>71.44</td>
<td>0.015</td>
<td>0.24</td>
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<tr>
<td>SBM</td>
<td>10.66</td>
<td>46.54</td>
<td>1.51</td>
<td>7.19</td>
<td>3.09</td>
<td>29.01</td>
<td>0.322</td>
<td>0.687</td>
</tr>
<tr>
<td>CGM</td>
<td>8.603</td>
<td>21.13</td>
<td>10.85</td>
<td>13.56</td>
<td>2.44</td>
<td>43.32</td>
<td>0.345</td>
<td>0.624</td>
</tr>
</tbody>
</table>

Calderano et al., 2014
Contrary to these findings Strighini et al. (2009) observed significantly (p<0.05) decrease in body weight gain with increasing level of CGM inclusion in diets. These variations in the reports were mainly due to variations in the composition of CGM. The results of enzyme supplemented groups receiving 0 percent CGM (T1) in their diets with low phosphorus supplemented with phytase enzyme were contradicts with reports of Jadhav et al. (2011).

The differences in feed consumption were non-significant (p>0.05) during different phases of experiment as well as cumulatively among all treatment groups fed different levels of CGM without (T1, T2, T3, and T4) and with phytase enzyme in their diets (T5, T6, T7, and T8). Phytase enzyme supplementation did not result in significant difference in feed consumption (T1-T5, T2-T6, T3-T7 and T4-T8). Brito et al. (2005) and Brunelli et al. (2006) also observed non-significant differences in feed consumption of broiler birds with different levels of CGM. However Brunelli et al. (2010) and Albuquerque et al. (2014) reported decreased feed intake with increasing level of CGM inclusion in layer diets. Albuquerque et al. (2014) reported that the lower feed intake of CGM based diets were due to high fat content of CGM. According to Mateos and Sell (1981), fat-rich diets promote slower feed passage rate. Increased fatty acid ingestion activates hormones that slow down peristaltic movements, increasing the time the digesta remains in the digestive system and promoting the perception of satiety thereby reducing feed intake. Bolka (2002) and Bingol et al. (2009) also reported non significant results in feed consumption with and without addition of phytase enzyme by keeping P<sub>n</sub> at low level similar to present study. The phase wise average FCR values were differing non-significantly (p>0.05) during all phases and also cumulatively among treatment groups fed increasing levels of CGM in absence of phytase enzyme (T1, T2, T3 and T4) and also in presence of phytase enzyme (T5, T6, T7 and T8) during all phases and also cumulatively The FCR values were differing significantly (p<0.05) only between 15 percent CGM fed groups without (T3) and with phytase enzyme (T7) in their diets during pre starter stage only and non-significant (p>0.05) during grower and finisher phases and also cumulatively when pair comparison (T1-T5, T2-T6, T3-T7 and T4-T8) was made. The findings of Brito et al. (2005) and Strighini et al. (2009) were in agreement with the present study, contrary to this Brunelli et al. (2006) observed decreased feed efficiency linearly with linear increase of defatted CGM inclusion in the diets. The PIS value found to be highest in T1 (162.5) and lowest in T5 (129.4). The EIS values were computed by considering PIS value and cost of diet per kg ranged from 8.687 (T1) to 6.635 (T7). Decrease in EIS values with increasing levels of CGM in the diets was observed in phytase enzyme non supplemented groups. This study reveals that CGM can be included in colored broiler diets up to 25% with and without phytase enzyme supplementation.

REFERENCES


