EFFICACY OF PHYTASE SUPPLEMENTATION OF LOW PHOSPHORUS CORN-SOYBEAN MEAL BASED DIETS FED TO BROILERS

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Summary

A study was conducted to demonstrate the effects of two sources of phytase at different levels of inclusion in low phosphorus corn and soybean meal based diets fed to male broilers. Two basal diets, standard P and the low P diet supplemented with phytase A at four levels and phytase B at two levels were formulated and fed as starter diets from 0 to 21 d and as finisher diets from 21 to 42 d. Mean body weight of broilers at 21 d was not significantly affected by level of phosphorus in the starter diet. However, phytase supplementation of the low P diet significantly improved mean body weight and feed conversion ratio. Forty two day mean body weight, weight gain and feed intake were significantly decreased on the low phosphorus diet, but this was for the most part corrected by the different levels of phytase supplementation of the low P diet.

I. INTRODUCTION

About 60-70% of the total phosphorus in cereal grains and vegetable protein meals is in the form of phytate phosphorus, which is not efficiently utilised by chickens (Perney et al., 1993). Phytate not only binds phosphorus but also exhibits other antinutritional properties in the feed by forming complex bonds with amino acids and minerals (Vohra et al., 1965; Oberleas, 1973 Caldwell, 1992; Camovale et al., 1998) which reduce nutrient digestibility and availability. It has been shown that phytase supplementation of the feed improves the phytate phosphorus utilisation in chickens (Edwards, 1993; Broz et al., 1994; Sebastian et al., 1996a; Kies et al., 2001) This study was undertaken to compare the effects of adding two sources of phytase enzyme at different levels to low phosphorus corn-soybean meal diets on the production performance of broilers compared with their performance when fed standard phosphorus diets without a phytase supplement.

II. METHODOLOGY

In this trial 2400 Ross male broilers were selected at one day of age according to average weight and allocated fifty to each of 48 deep litter floor pens. There were eight experimental diets and each diet was offered to six pens (a total of 300 chickens per diet). The broiler starter diets were offered from one to three weeks and the finisher diets from three to six weeks. There were two basal diets at each stage, a standard P and a low P diet. Each basal diet contained maize and soybean meal as major ingredients to provide 12.76 MJ ME, 215g CP and 12.3g lysine/kg in the starter diet and 13.03 MJ ME, 195g CP and 11.0g lysine/kg in the finisher diet. The major difference between these two basal diets was in total and non-phytate P content.

The standard P diets had available P contents of 4.0 and 2.8 g/kg in the starter and finisher stages, respectively, whereas the low P diets had available P contents of 3.2 and 2.0 g/kg in the starter and finisher stages, respectively. To test the efficacy of the phytase

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enzymes, the low P diets were supplemented with four levels of Phytase A* and two levels of Phytase B.** The treatments were as follows: 1. Standard P, no phytase, 2. Low P, no phytase, 3. Low P + 250U phytase A /kg, 4. Low P + 500U phytase A /kg, 5. Low P + 750U phytase A /kg, 6. Low P + 1000U phytase A /kg, 7. Low P + 500U phytase B /kg and 8. Low P + 1000U phytase B /kg. All birds and residue feed were weighed in each pen on days 21 and 42, and when mortality occurred, time of death and the weight of the dead bird were recorded to make adjustment in the calculation of feed conversion ratio (FCR). Group data were analysed statistically using the SAS (SAS Inc., 2000) programme to determine the significance of difference among the treatments for the measured parameters.

III. RESULTS

The mean body weight, feed intake, FCR and mortality of chickens fed the phytase supplemented and unsupplemented corn soybean meal based diets are presented in Table 1.

0-21 days performance:

The chickens fed the low P diet supplemented with 750U of phytase A were significantly heavier than those fed the non-supplemented low P diet. However the mean body weights of the other groups of phytase supplemented birds were not significantly different from the groups fed either the standard or the low P basal diets. The feed intakes of the groups fed the low P diet supplemented with 500 or 750U of phytase A were significantly less than the feed intake of the group fed the normal P basal diet, but the intakes of the other groups did not differ significantly. The feed conversion ratio was significantly better for the group fed the low P diet supplemented with 750U phytase A than for all the other groups except those fed the low P diets supplemented with 500U or 1000U of phytase A. Broiler performance was not significantly different between the groups fed the diets supplemented with phytase A or phytase B. Mortality level was not significantly different among the groups fed the phytase supplemented or unsupplemented diets.

0-42 days performance:

The birds fed the standard P diets were significantly heavier (by 4.3%) at 42 d than those fed the low P basal diets. There was no significant difference in mean body weight between the groups fed the standard P diet and all the phytase supplemented low P diets except for the group that was supplemented with 750U of phytase A, which was not significantly different from the group fed the low P diet. The two groups fed the low P diet supplemented with phytase B were significantly heavier than those fed the unsupplemented low P diet. Similar improvements in broiler performance after phytase supplementation were reported by Edwards, (1993); Broz et al., (1994); Sebastian et al., (1996a); Kies et al., (2001) and Huang et al., (2003). Birds fed diets supplemented with phytase A at 250, 750 and 1000U/kg of feed ate significantly less feed than those fed the positive control diet. Feed conversion ratio was not significantly affected by the source of phytase enzyme or its level of inclusion in diets.

* marketed by Danisco Animal Nutrition, UK.  ** marketed by BASF, Germany
Table 1. The effect of phytase supplementation of low phosphorus corn-soybean meal based diets on body weight, weight gain and food intake (g/bird), FCR and mortality (%) in broilers at 21 and 42 days of age.

<table>
<thead>
<tr>
<th>Diets</th>
<th>0-21 Days</th>
<th>0-42 Days</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Body weight</td>
<td>Weight gain</td>
</tr>
<tr>
<td>Standard P Diet</td>
<td>799abc</td>
<td>759abc</td>
</tr>
<tr>
<td>Low P Diet (Low P)</td>
<td>777bc</td>
<td>739bc</td>
</tr>
<tr>
<td>Low P + 250 U Phytase A / kg</td>
<td>803ab</td>
<td>764ab</td>
</tr>
<tr>
<td>Low P + 500 U Phytase A / kg</td>
<td>770c</td>
<td>731c</td>
</tr>
<tr>
<td>Low P + 750 U Phytase A / kg</td>
<td>810a</td>
<td>770a</td>
</tr>
<tr>
<td>Low P + 1000 U Phytase A / kg</td>
<td>807ab</td>
<td>767ab</td>
</tr>
<tr>
<td>Low P + 500 U Phytase B / kg</td>
<td>802ab</td>
<td>762ab</td>
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<tr>
<td>Low P + 1000 U Phytase B / kg</td>
<td>801abc</td>
<td>762ab</td>
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<td><strong>LSD_{0.05}</strong></td>
<td>31</td>
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The highest mortality of 5% was recorded in the group fed the normal P diet which was significantly greater than in the group given phytase B at 500 U/kg (2.0%). Most of the deaths in the trial were attributed to Sudden Death Syndrome. The results show that the performance of broilers fed low phosphorus corn-soybean meal based diets can be significantly improved by phytase A or phytase B supplementation. The present data indicates that phytase A or phytase B can replace 41% and 54% DCP in starter and finisher diets, respectively, without significantly affecting broiler performance.

REFERENCES


