The effect of phytase supplementation on the performance and phosphorus utilisation in broilers fed rice bran based diets.

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Introduction

In any poultry enterprise feed is the most important factor that determines the feasibility of the activity. In Malaysia, most of the feed ingredients for poultry, such as corn, soyabean meal, fish meal, are imported. In fact, in 2002 Malaysia imported about 2.0 billion worth of feedstuffs from many countries. Rice bran is a by-product of the rice milling industry is also an energy source and can be used as a feed ingredient. However, the use of rice bran in poultry feed is limited by an anti-nutritional factor known as phytic acid, which combines with phosphorus to make it unavailable. In most poultry rations, corn is the main energy source and if rice bran can replace corn, much foreign exchange can be saved by the country. This study examine the effect of supplementation of phytase enzyme, vitamin D3 or dicalcium phosphate (DCP) on the growth performance and digestibility of nutrients and tibia ash of broiler chickens fed rice bran based diets.

Materials and Methods

A three week growth trial with 288 straight-run 21 day old Arbor Acre broiler chickens was conducted to examine effects of graded levels of microbial phytase (Natuphos® 5000) and vitamin D_3 supplementation on performance and the nutrient utilisation and ash contents of toe and tibiae. Four replicate pens consisting of 8 chicks per pen were used against 9 dietary treatments in a completely randomised design. There were a basal diet (negative control), a positive control (basal+dicalcium phosphate). With the basal diet, phytase was added at a levels of 350, 700, 1050 or 1400 FTU/kg and vitamin D_3 was added at a levels of 250, 750 and 1500 IU/kg. Six birds were slaughtered from each treatment to determine the carcass composition and dressing percentage. The growth trial was followed by a digestibility trial. The birds consumed diets supplemented with phytase or vitamin D_3, showed similar performance with those fed diet adequate in phosphorus. No difference was noted in the AME values and digestibility of DM, CP, Ca and P. Except shank weight, dressing percentage and weights of internal organs were not influenced by phytase or vitamin D_3. Phosphorus excretion was reduced in the diets supplemented with phytase or vitamin D_3. Toe and tibiae ash contents was increased at higher level of phytase or vitamin D_3 or the diet adequate in P.

Results and Discussion

The results show that neither supplemental phytase nor Vitamin D3 had significant effect on feed intake ($p>0.05$). Similarly the FCR was not affected by addition of exogenous phytase or Vitamin D3 from 21-27 days of age. Different results were obtained from 28-34 days of age. During this period poorer FCR was noted for Diets 1, 2, 5 and 6. On the other hand, from 35-42 days of age, higher FCR values were noted for Diet 7 and Diet 8. However, the overall FCR values were not influenced by supplemental phytase or vitamin D_3.

The dressing percentage, weight of (% of body weight) gizzard, liver, heart, abdominal fat, and shank are presented in Table 4. Lack of significant difference was observed in the dressing percentage and weights of gizzard, liver, heart, abdominal fat, and shank. On the other hand, shank weight of birds fed Diet 1, was significantly lower ($p<0.05$) than those consumed Diet 2 (supplemented with DCP), Diet 5 (phytase 1050 FTU/kg), Diet 6 (phytase 1400 FTU/kg) and Diet 8 (Vitamin D3,750 IU/kg diet). No significant difference was noted in the shank weight of birds consumed diets supplemented with phytase, Vitamin D3 or DCP.

The apparent metabolisable energy (AME), digestibility of DM, CP, Ca and P showed that there were no significant difference in the digestibility of DM, CP, Ca and P due to the dietary treatments. No effects of phytase or vitamin D3 or DCP were observed in the digestibility coefficients. Similar digestibility values were noted for Ca and P in all dietary treatments. The digestibility of dry matter was similar in diets with addition of phytase or vitamin D3 to the low P diet as compared to the control.

Phosphorus intake was significantly higher ($p<0.05$) for the birds fed Diet 2. No significant differences were observed in the P intake of the birds consumed diets without added DCP (Diet 1, 3, 4, 5, 6, and 9). Markedly higher ($p<0.05$) amount of P was excreted in the faeces of birds offered Diet 2. The rate of P excretion was reduced with increasing levels of supplemented phytase. Both phytase and vitamin D3 had no role in improving the digestibility of Ca and P. The amount of P excretion was significantly reduced when the diets were supplemented with phytase as compared to the control (Diet 1). In the findings of the present study, a reduction of 5% in P and Ca excretion was observed as compared to the control. Reduction in P excretion indicates that phytate-P has been hydrolysed and become available for absorption or use. However, the P excretion tended to

be reduced with increasing levels of phytase or vitamin D_3.The higher correlation noted from the digestibility curve support the fact that phytase liberates Ca from the Ca phytate complex and as the availability of P increases, the availability of Ca also increases because both are part of the same complex. Improved digestibility of Ca and P also observed with supplemental vitamin D3. However, vitamin D3, Ca and P have complex interaction on the absorption of Ca and P. It is recognised that vitamin D3 influences the absorption of P from the small intestine. Phosphorus on the other hand seems to be involved in regulation of vitamin D3 metabolites.

Toe ash was increased significantly when Diet 1 was supplemented with 1050 and 1400 FTU of phytase, or 1500 IU of vitamin D3 or DCP. On the other hand, similar tibia ash contents was noted for all dietary treatments. Response curves (Figure 7, 8, 9 and 10) were drawn against ash contents of toe and tibia.

Conclusions

The results of this study showed that final body weight, weight gain and FCR values were not affected when P deficient diet was supplemented with microbial phytase, DCP and vitamin D_3. This suggests that supplementation with either vitamin D3, phytase or DCP were effective in alleviating the effects of P deficient diets. The toe ash contents were significantly higher for higher levels phytase and vitamin D_3 or DCP as compared to the control. On the other hand amount of P excretion was significantly lower in the diet supplemented with phytase or vitamin D_3 as compared to the diet supplemented with DCP. It can be concluded that due to supplemental phytase or vitamin D_3 phytate phosphorus was utilised by the chicken, amount of phosphorus excretion was reduced and broiler broilers could be formulated without added inorganic phosphorus.

Benefits from the study

This showed that if poultry rations are formulated carefully, and palm oil is used to provide part of the energy then rice bran can be included at levels higher than 25 %. Earlier studies showed that rice bran can be included at 15% for optimum growth and performance. Increasing use of rice bran can reduce import of corn, hence a saving in foreign exchange.

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Nil

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Nil

Project Publications in Refereed Journals:

Nil

Project Publications in Conference Proceedings

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Graduate Research

Name of Graduate	Research Topic	Field of Expertise	Degree Awarded	Graduation Year
M. A Ukil	**Phytase phosphorus in rice bran poultry nutrition**	**Poultry Nutrition**	**Ph.D.**	**2000**

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