Title: Available phosphorus requirement of laying hens
Project No: 1UQ101
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The objective of this project was to determine the available phosphorus (AP) requirement of laying hens and to examine the effect of different dietary AP and calcium (Ca) concentrations on egg production and egg shell quality from the start of lay to 80 weeks of age. The influence of dietary phytase supplementation was also examined.

The established adequate Ca and phosphorus (P) levels for layers have been challenged due to continuous advances in genetic improvement, nutrition, environment, and management. Furthermore, P has attracted much attention from both scientists and related industries in the areas of nutrition (e.g. its role in various biological processes, especially in maintaining optimum egg shell quality) and environmental protection (e.g. P supplements for animal feed are derived from rock phosphate that is non-renewable and becoming increasingly scarce and expensive). Laying hens meet their requirements for this essential nutrient from the diet. A larger safety margin of P in commercial poultry diets has been the common practice for many years. There is also uncertainty in relation to the variable amounts of phytate P in basal diets used within previous studies. There has been limited research on the actual P requirement of laying hens in recent years. Any approach with the potential to reduce the dietary P supplementation of laying hens without affecting their productivity would have a significant impact in reducing the cost of egg production and wastage of P resources.

Two experiments were undertaken whereby diets with or without phytase were fed to Hy-Line brown egg laying hens from the first lay to 80 weeks of age. Wheat and sorghum diets contained Ca of 42 g/kg diet and the AP of 1.5, 2.0, 2.5, 3.0, 3.5 and 4.5g/kg diet in Experiment 1; and the AP levels of 1.5 and 2.5 g/kg diet and each with three levels of Ca (32, 42 and 48 g/kg diet) in Experiment 2. Egg production, feed intake, body weight, egg and egg shell quality parameters were measured. Retention of Ca and P, tibia and toe ash contents and Ca and P in blood were tested at the end of experiments.

A high level of egg production was maintained in both experiments and it appears that all the dietary AP concentrations met the P requirement of hens even at the lowest level of 1.5 g/kg diet (for hens fed wheat and sorghum based diets). The AP content of layer diets used by the industry is considerably higher than the reported values and also the National Research Council (NRC 1994) recommendation. This suggests that current dietary usage of P is in excess of the hens' requirement. The results obtained from the present study are in agreement with overseas reports, which suggest that modern laying hen strains have much lower AP requirements than earlier strains.

The study also found large quantities of Ca were excreted even with lowest dietary Ca, even from those birds fed the diet with the lowest Ca level; a level lower than the values used by the industry. This demonstrated that Ca in commercial layer diet may also be in excess of the hens' requirement and worthy of further research.

The significant beneficial effect of phytase was not observed possibly due to the fact that dietary AP and Ca met hens' requirements for these minerals.