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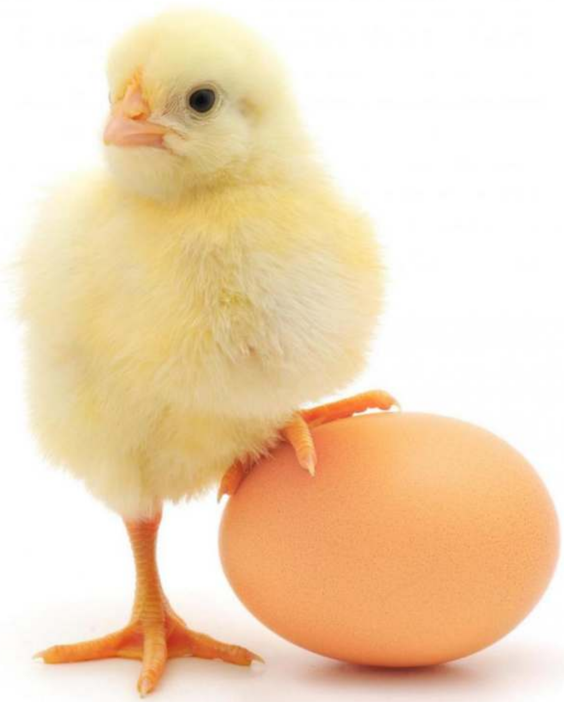

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ANSInet
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan
Mob: +92 300 3008585, Fax: +92 41 8815544
E-mail: editorijps@gmail.com

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Effect of Phytase on the Growth Performances of Growth of Laying Hens (Warren)

Guichard L. Bohoua and Clarisse K. Koné Yelakan
Département des Sciences et Technologies des Aliments,
Université d'Abobo-Adjamé, 02 BP 801 Abidjan 02, West Africa

Abstract: This study consists of supplementing the feeding of laying hens with phytase at various proportions and evaluating its influence on the average weight and the index of consumption. The experiment was led during 6 weeks on 4 batches of 50 laying hens. These batches respectively received a supplementation of 0 G/kg food (pilot batch), 1.36 g/kg (batch 1), 2.72 g/kg (batch 2), 4.05 g/kg (batch 3). Each week the laying hens are weighed and the feeding efficiency index calculated. The results revealed that the best batch was batch one in terms of profit of weight gained the feeding efficiency index.

Key words: Phytase, layer, feeding efficiency index, weight

Introduction

The poultry diet can be defined in term of energy, amino acids, minerals and vitamins (Smith, 1997). To maintain chickens in good health and to enable them to ensure the maximum of production, it is necessary to provide what they need. Each ingredient of the feeding must meet the needs without being in excess (Pagot *et al.*, 1983). The phytase is a very significant enzyme in the diet of poultry. It allows a better use of phosphorus and calcium, which are very significant minerals for the growth (Smith, 1997). However, it cannot be secreted by the organism of chickens (Van *et al.*, 1997), requiring thus its addition to the diet in the form of salt. The supplementation of the phytase must be done with precaution because an excess or a deficiency can decrease the availability of minerals (Lonnerdal, 1989). Therefore, the effect of the addition of phytase in poultry feedings and the evaluation of its influence on the performance of chickens will be studied in this experiment.

Materials and Methods

Biological material: The experiment was conducted on 200 one day chicks (Warren stock) were obtained from PROVETO.

Technical material: The material used throughout our experiment is as follows:

1. A hammer mill of 15 horses of power,
2. Plastic siphoïdes feeding troughs (3 to 5 liters)
3. A 50cm of diameter Circular mangers
4. An electric mixer of 400 kg
5. A world mark scale with a capacity of 20 kg and a precision of 0.1

Determination of the average weight of the subjects: The average weight is the ratio of the total weight of laying hens of a given batch on the number of laying hens. It is expressed in gram (g).

Determination of the feeding efficiency index: The index feeding efficiency index (FEI) is the value represented by the ratio of the average quantity of feedings consumed on the average weight of the individuals. It does not have a unit and is determined as follows:

$$FEI = QM / PM$$

QM: average quantity of consumed feed
PM: average weight of laying hens

Preparation of the feedings: The feedings formulations used in our experiment were elaborated in our laboratory. Phytase was then added to various proportions according to the batch experiment.

Experimental design: The experimental subjects were divided into 4 batches of 50 chicks:
Pilot batch (not of phytase): the feeding of this batch does not contain phytase 1,36 g; 2,72 g; 4,05g per kilogramme of feed were respectively added to batch one, two and three.

Statistical analyses: Statistical analysis was carried out using a "Statistica Data Management" software. The analysis of variance and the comparison of average made our study possible to appreciate the significant differences between various batches.

Results and Discussion

Figure 1 shows the trends of the weight of different batches over a period of six weeks. The curves have an increasing pace. These batches are then classified based on statistical analysis. The best batch is batch 1 followed up by batches 2, 3 then the pilot batch.

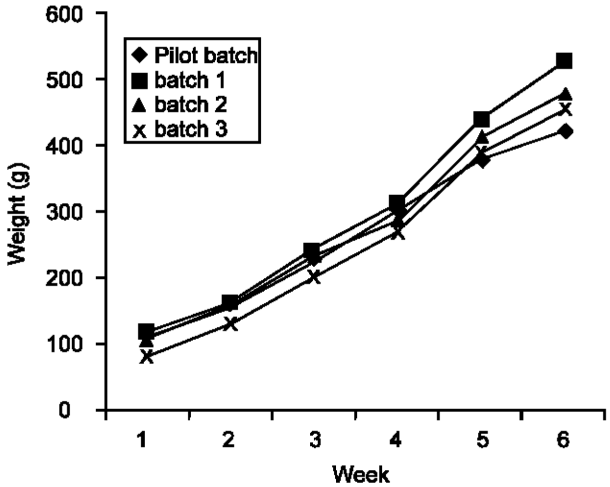

Fig. 1: Weight of the laying hens

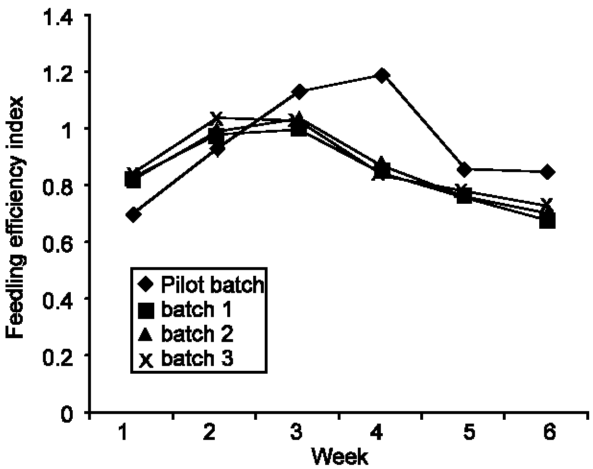

Fig. 2: Feeding efficiency index

Batches 2 and 3 despite their higher quantity of phytase higher than that of batch 1, have their growth slowed down when compared to batch 1. A high quantity of phytase involves a high phosphorus secretion in the organism. However, phosphorus and calcium are minerals which interact after their ingestion (Lonnerdal, 1989). A high secretion of one (phosphorus) can prevent the action of the other (calcium), by the inhibition of the latter by vitamin D3 (Smith, 1997). Thus, a deficiency of calcium will be inevitably reflected on the growth performances of the chicken and on the feeding efficiency index. Pagot *et al.* (1983) showed that a high dosage of phytase also makes possible the release of an excess of some micronutrients such as copper and iron. Copper, for quantities exceeding 250mg/kg becomes toxic for the animal (Shivanandappa *et al.*, 1983) and tends to decrease the feed ingestion and the body growth. This same effect is also observed when a high iron dosage is ingested (Cao *et al.*, 1996). In chicken nutrition, a use of 8 copper mg improves the growth performances (Fisher *et al.*, 1973).

The best batch is batch 1, not only with regard to the weight gained but also for its lowest FEI. Batch 1 is followed-up by batch 2 and 3 equally coming in the second position and finally the pilot batch ranked in the fourth place (Fig. 2). The performance of batch 1 can be explained by the fact that the quantity of phytase used in this batch is the required quantity allowing an ordered action of the phytase in the body (Swick, 1992). Phytase by its action releases phosphorus and thus increases its availability (Vansilckle, 2003), because phosphorus being in the form of phytate in cereals is less digestible by poultry (Van *et al.*, 1997). An adequate quantity of phytase in the body increases the affinity of the vitamin D_3 for phosphorus, thus facilitating its assimilation, favoring the growth of the subjects. Phosphorus also intervenes in the metabolism of the carbohydrates and allows their assimilation. It is also necessary to the production of the gastric juice; juice being essential to the digestion of the feed (Dumond, 1980).

The pilot batch of the experiment is the last compared to other batches. This position is due to the absence of phytase in the feed. In this feeding, it was not made a supplementation of phytase. Phytate exists in almost all vegetables ingredients used in animal feeds (Chauhan *et al.*, 1989; Grafe and Easton, 1990). We can thus state the phytate present in this feed does not undergo reactions facilitating the release of phosphorus. The absence of the phytase cannot prevent the action of phytic acid. In fact, phytic acid has a negative effect on absorption of ions such as Zn^{2+}, Fe^{2+}, Mn^{2+}, Cu^{2+}, Ca^{2+} (Morris, 1996).

During digestion, this acid released by the feed can form complexes with these available ions in chyme (Schlemmer *et al.*, 1995). Phytase used as a feeding supplement will hydrolyze the released acid preventing thus the formation of acid complexes with Zn^{2+}, Fe^{2+}, Mn^{2+}, Cu^{2+}, Ca^{2+}. These ions will remain available in the body and play an important function.

Conclusion: At the end of our experiment, we found out phytase indeed improves the growth performances and the feeding efficiency index of the laying hens.

The required quantity of phytase to have good results or optimize the growth performances is 1,36 g/ kg of feed. Higher dosages of phytase give less satisfactory results.

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