broiler diets studied

xylanase to an nPP-deficient diet improved performance or enhanced the response to phytase. There were no significant interactions between phytase and xylanase, and I have chosen not to show those results. Table 3 shows the growth performance and ash response to the seven levels of nPP. There were significant responses for all criteria measured. Visual inspection suggests that, in this research, the nPP requirement was approximately 0.35–0.40%.

A standard curve was constructed using the increasing levels of nPP as the independent variable (X) and the related bone ash content values as the dependent variable (Y). The equation generated from the standard curve — \( Y = -199.63X^2 + 196.32X - 3.349 \) (R-square = 0.906) — was then used to calculate the estimated nPP content of each enzyme treatment based on their respective tibia ash percentages. The specific nPP equivalency contributed by the enzyme was calculated by subtracting the nPP level of the basal diet (0.15%). The calculated percent nPP equivalency values are shown in Table 4.

Phytase supplementation had significant and positive impacts on the mean equivalent nPP values (including the xylanase treatments), as shown in Table 4. The recommended level of phytase (500 FTU) resulted in a mean nPP equivalent of 0.084%, an incremental increase of 0.068%. Subsequent phytase levels of 2X, 3X and 4X the recommended level resulted in incremental nPP levels of 0.025%, 0.038% and 0.044%, respectively, much smaller than the first (recommended level) addition of phytase. However, the incremental response to subsequent levels of phytase (2X, 3X and 4X the recommended level) is not diminishing and may be increasing.

Comment

The mean nPP response to levels of phytase is shown in the Figure, which suggests that, in this research, the maximum response to the addition of phytase had not occurred, even at 4X the recommended level. At 4X the recommended level of phytase, the nPP equivalent response of 0.191 is still only 73% of the phosphorus in the basal diet that is not nPP (from Table 1: total phosphorus minus nPP (0.41–0.15 = 0.26)). That 73% is not far off from 70%, which is frequently suggested as the maximum amount of phytate phosphorus that is released by phytase. At the same time, adding the maximum equivalent phytase response (0.191) to the nPP content of the basal diet (0.15) yields a total of 0.341 nPP, which is close to the level of nPP (0.35–0.40, from Table 3) that appeared to support maximum growth performance.

It must be recognized that this research had three key characteristics that are essential: (1) the phytase enzyme was effective, (2) the basal diet was critically deficient in nPP and (3) there was a high level of phosphorus in the basal diet that was not nPP.

1a. This phytase enzyme may not be as effective in other diets; other phytase enzymes may not be as effective as this phytase enzyme.

2a. To obtain a response to phytase, the basal diet must be deficient in phosphorus; the greater the deficiency, the larger the expected response.

3a. Phytase must have an appropriate substrate to act on.

In this basal diet, 0.26% phosphorus apparently was not nPP phosphorus. This phosphorus was not characterized, but a significant portion was probably phytate phosphorus.

The response to superdosing enzymes will likely be limited by: (1) the effectiveness of the enzyme, (2) the degree of nutrient deficiency and (3) the availability of substrate.

The Bottom Line

Under the conditions of this research, phytase supplementation significantly improved performance and continued to improve performance even at supershielding levels 4X the recommended level of addition.

However, the xylanase used did not improve the release of phosphorus.

Reference


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