

Impact of dietary calcium level, non-phytate phosphorus level and feeding time on phosphorus digestibility of SBM in broilers

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In addition to dietary calcium (Ca) level, dietary non-phytate phosphorus (nPP) level and feeding duration may be important factors to impact the phosphorus (P) digestibility of ingredients, as birds will likely adapt to P deficiency over time. Therefore, a battery study was conducted to evaluate the dietary Ca level, nPP level and feeding duration on P digestibility of SBM in broilers. A total of 512 birds were allocated to 8 dietary treatments in a $2 \times 2 \times 2$ factorial arrangement (0.59% or 1.02% dietary Ca; SBM with 0.17% nPP or SBM-dicalcium phosphate blend with 0.30% nPP; 5 d or 40 h feeding). The 5 d or 40 h feeding was from d 16 to d 21 or from d 19 to d 21. Each diet was provided to 8 replicate pens of 8 birds in mash form. On d 21, all birds were sacrificed to collect ileal digesta for nutrient digestibility. Data were analyzed by three-way ANOVA to evaluate the main effect of dietary Ca level, nPP level, feeding duration and their interactions on P digestibility of SBM. Statistical difference or a tendency were declared at $P \leq 0.05$ or $0.05 < P \leq 0.10$. The results showed a tendency ($P = 0.09$) to have a significant interaction between dietary Ca level and feeding duration on P digestibility of SBM. At 40 h feeding, high Ca significantly decreased the P digestibility of SBM from 40.2% to 29.4%. However, at 5 d feeding, the P digestibility of SBM was not impacted by dietary Ca level; the values were 45.5% and 42.1% with low and high Ca, respectively. The results at 5 d feeding were not able to show the influence of dietary Ca on P digestibility of SBM, as the values at 5 d feeding were most likely overestimated. This may be due to the birds have already adapted to P deficiency at 5 d feeding. Although the interaction among the three factors was not detected by the statistical model, the data showed dietary nPP level impacted the P digestibility of SBM differently at the two feeding durations and dietary Ca level combinations. At 5 d feeding with high Ca, the P digestibility of SBM in 0.17% nPP group was 9.5% higher than that in 0.30% nPP group; while at 5 d feeding with low Ca, the difference of P digestibility of SBM between two nPP groups was 0.1%. At 40 h feeding with low or high Ca, the difference of digestibility between two nPP groups was 0.0% or 1.5%. The results suggested that, at 5 d feeding with high Ca, the P digestibility of SBM was decreased with incremental nPP level, but the digestibility was consistent with altered nPP levels at 40 h feeding with both low and high Ca. Taken together, 40 h feeding duration is recommended for the evaluation of P digestibility of SBM, which was observed to be 40.2% and 29.4% at 0.59% and 1.02% dietary Ca inclusion rates, respectively.

Keywords: phosphorus digestibility, feeding duration, calcium, non-phytate phosphorus, SBM