

### Effects of limestone particle size and dietary Ca level on apparent P and Ca digestibility in the presence or absence of a 6-phytase

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Phytate P utilization by broilers can be enhanced by phytase enzymes, but is affected by diet Ca level, Ca source and solubility, mainly through the formation of Ca-phytate chelates. The present study evaluated effects of limestone particle size and Ca level on apparent ileal digestibility (AID) of P and Ca in the presence or absence of a 6-phytase derived from *Buttiauxella* spp., expressed in *Trichoderma reesei*. The design was a factorial arrangement of 2 limestone particle sizes from the same limestone source (pulverized <0.037 mm (PL) and un-ground (UL) 0.42 mm mean particle size); 3 Ca levels (0.6, 0.8, 1.0%) and 2 phytase levels (0 and 1000 FTU/kg). The treatments (Trt) were replicated 9 times (3 birds/replicate). A corn SBM basal diet was mixed with no inorganic P or Ca. The UL or PL and phytase were then added to achieve the Trt diets. Starting at 26 d of age, broilers were fed the Trt for 32 h. There was a Ca level x particle size x phytase interaction on P and Ca AID, thus data were analyzed separately based on phytase inclusion using 2 factors (particle size, Ca level). In diets with no phytase, P AID was greater ( $P < 0.01$ ) in UL (28.22%) than in PL (22.52%) diets but Ca level had no effect ( $P=0.062$ ). In diets with phytase, there was a particle size x Ca level interaction with no effect of Ca level on P AID in diets with UL but an effect ( $P<0.01$ ) when PL was used. The P AID was 64.8, 62.8, 64.1% and 65.5, 57.4, 50.9% for UL and PL diets containing 0.6, 0.8, and 1.0% Ca, respectively ( $P<0.01$ ). In diets without phytase, Ca AID was affected by Ca level ( $P < 0.01$ ) but not particle size. In diets with phytase, a particle size x Ca level interaction resulted from a greater effect of Ca level on Ca AID when diets contained UL vs. PL. In summary, the impact of Ca level on P AID was dependent on particle size and phytase inclusion.

Key words: limestone particle size, calcium, phosphorus, phytase, broiler

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