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Authors: B.S. Vieira, F.G. Silva, C.F.S. Oliveira, A.B. Correa, J.G. Caramori Junior, G.S.S. Correa

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Does citric acid improve performance and bone mineralization of broilers when combined with phytase? A systematic review and meta-analysis

B.S. Vieira*, F.G. Silva, C.F.S. Oliveira, A.B. Correa, J.G. Caramori Junior, G.S.S. Correa

College of Veterinary Medicine, Federal University of Mato Grosso 2367 Fernando Correa da Costa Avenue, Cuiaba – MT – Brazil. 78060-900

* Corresponding author. Email: vieirabs@hotmail.com

Highlights

- A comprehensive systematic review of the literature with meta-analysis was performed.
- Citric acid enhances broiler weight gain by 2.46 g/day when combined with phytase.
- Citric acid improves broiler tibia ash content by 3.27% when combined with phytase.
- Combination of citric acid and phytase should be further explored in poultry nutrition.

Abstract

The aim of this meta-analysis was to critically determine whether citric acid (CA) improves performance and bone mineralization of broilers when used in combination with phytase (PHY) in low-phosphorus diets. A systematic review of the literature was performed electronically on PubMed, Scielo, Science Direct, Scopus, and Web of Science databases; from the total of 574 identified studies, only seven met all the inclusion criteria (3862 broilers). Dietary PHY ranged from 300 to 4000 FTU/kg; CA from 20 to 50 g/kg. Mean differences between PHY+CA and PHY treatments on daily weight gain (DWG), daily feed intake (DFI), feed conversion ratio (FCR), and tibia ash content (TAC) were compared using a random-effects model. Also, subgroup analyses were performed to assess the potential interference of feed and non-feed related characteristics on the overall effect estimates. Chickens fed PHY+CA gained, on average, 2.46 g/day more (P=0.005) than those fed exclusively with PHY. While no differences on DFI and FCR were detected between