

Effect of microbial phytase on apparent ileal digestibility of amino acids; Meta-Analysis approach

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Phytic acid is the major form of phosphorus (P) in plant feed ingredients used in pig diet. It has been suggested that phytate is able to bind to proteins and amino acids (AA) and to affect negatively apparent ileal digestibility (AID) of AA in pigs. However, the effect of microbial phytase supplementation on AID of AA in pigs is conflicting and inconsistent in literature. The objective of this study is to evaluate the effect of microbial phytase supplementation on the AID of AA in pigs taking into account main variation factors, such as dietary neutral detergent fiber concentration (NDF), dietary crude protein level (CP) and dietary phytic P level (PP), through meta-analysis. The database consisted in 41 articles published between 1994 and 2015, including 58 experiments in order to predict the effect of microbial phytase on AA digestibility. Prediction models of AA digestibility were performed with the GLM procedure of Minitab software.

A multiple regression model was obtained. Microbial phytase supplementation increases linearly the AID of Thr, Leu, Ile ($P < 0.01$; Thr, $R^2 = 86\%$; Leu, $R^2 = 86\%$, Ile, $R^2 = 83\%$), Lys, His, Met, and Val ($P < 0.05$; Lys, $R^2 = 85\%$; His, $R^2 = 70\%$; Met, $R^2 = 91\%$; Val, $R^2 = 85\%$), while it's only a tendency for Trp ($P = 0.06$); $R^2 = 95\%$). Beside the AID of Arg and Phe was quadratic ($P < 0.05$; Arg, $R^2 = 90\%$; Phe, $R^2 = 87\%$). NDF influenced quadratically AID of all essential AA ($P < 0.05$), excluding His ($P = 0.06$) and Met ($P > 0.1$). Only the AID of Lys, Thr and Arg increased with increasing CP level ($P < 0.05$). Dietary PP concentration affected negatively the AID of Arg (linear and quadratic, $P < 0.05$), and tended to affect AID of Lys (linear, $P = 0.08$) and Val (linear $P = 0.08$ and quadratic, $P = 0.07$), PP level doesn't affect the AID of other essential AA ($P > 0.1$). No interactions between microbial phytase and other X variables were found.

Implications: The current study showed that microbial phytase supplementation affected positively the AID of essential AA and this effect was not modified by other dietary components such as fiber, PP and protein. The current models allow quantifying the effect of microbial phytase on AA which is important to use phytase feed enzyme accurately in diet formulation.