

# Effect of microbial phytase on apparent ileal digestibility of amino acids: first step of a meta-Analysis approach.



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## Introduction

- ❖ 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.

## Objectives

- ❖ 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 phytic P level (PP), dietary neutral detergent fiber concentration (NDF) and dietary crude protein level (CP) through meta-analysis.

## Materials and Methods

- ❖ The database consisted in 36 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.

## Conclusions

- ❖ Microbial phytase increased AID of essential AA independently of PP, fiber, and protein.
- ❖ The current models allow quantifying the effect of microbial phytase on AA digestibility which is important to use phytase feed enzyme accurately in diet formulation.

## References

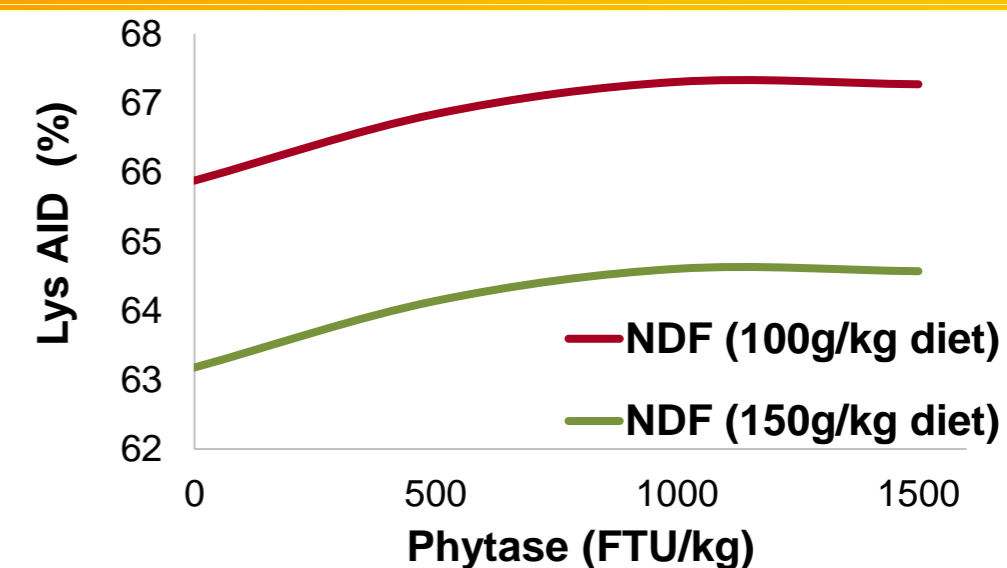
(Selle et al., 2000 ; Kies et al., 2001; Adeola et al., 2003 ; Liao et al., 2005 ; Rutherford et al., 2012 ; Yu et al., 2012)

## Results and discussion

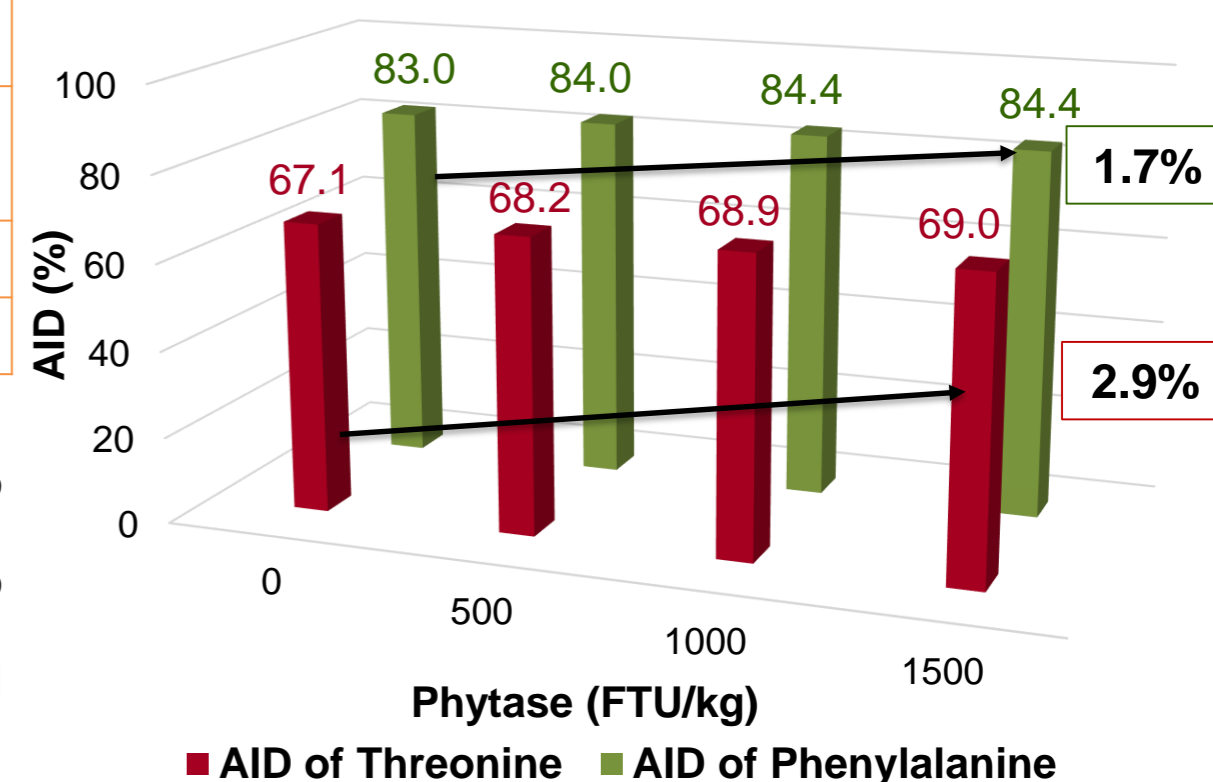
	Arg	His	Ile	Leu	Met	Phe	Thr	Lys	Val
Intercept	78.7	70.1	88.5	82.8	93.7	78.6	53.4	57.9	86.5
P-value	***	**	***	***	***	***	**	***	***
Phy	1.95	3.6	2.44	2.13	1.63	2.41	2.78	2.43	2.14
P-value	10 <sup>-3</sup>	10 <sup>-3</sup>	10 <sup>-3</sup>	10 <sup>-3</sup>	10 <sup>-3</sup>	10 <sup>-3</sup>	10 <sup>-3</sup>	10 <sup>-3</sup>	10 <sup>-3</sup>
	**	*	**	**	*	**	**	*	*
PP	-3.73	-1.72	-1.71	-2.74	-2.45	0.82	-1.72	-4.36	-3.88
P-value	*	ns	ns	ns	ns	ns	ns	◆	◆
NDF	-0.20	-0.16	-0.25	-0.16	-0.14	-0.26	-0.22	-0.17	-0.24
P-value	***	*	***	***	ns	***	***	**	***
CP	0.20	0.19	0.05	0.08	-0.01	0.19	0.31	0.33	0.07
P-value	*	ns	ns	ns	ns	ns	*	*	ns
Phy*Phy	-1	-1	-1	-1	-1	-1	-1	-1	-1
P-value	10 <sup>-6</sup>	10 <sup>-6</sup>	10 <sup>-6</sup>	10 <sup>-6</sup>	10 <sup>-6</sup>	10 <sup>-6</sup>	10 <sup>-6</sup>	10 <sup>-6</sup>	10 <sup>-6</sup>
	*	ns	◆	*	ns	*	◆	◆	◆
PP* PP	0.65	0.35	0.16	0.38	0.52	-0.18	0.39	0.67	0.68
P-value	*	ns	ns	ns	ns	ns	ns	ns	◆
NDF* NDF	4.98	4.37	6.66	4.21	2.87	6.98	5.99	4.64	6.44
P-value	10 <sup>-4</sup>	10 <sup>-4</sup>	10 <sup>-4</sup>	10 <sup>-4</sup>	10 <sup>-4</sup>	10 <sup>-4</sup>	10 <sup>-4</sup>	10 <sup>-4</sup>	10 <sup>-4</sup>
	***	◆	***	**	ns	***	***	**	***
CP* CP	-3.26	-3.67	6.5	-4.9	8.1	-4.09	-5.99	-6.21	-4.2
P-value	10 <sup>-4</sup>	10 <sup>-4</sup>	10 <sup>-5</sup>	10 <sup>-5</sup>	10 <sup>-5</sup>	10 <sup>-4</sup>	10 <sup>-4</sup>	10 <sup>-4</sup>	10 <sup>-5</sup>
	ns	ns	ns	ns	ns	ns	ns	ns	ns
R <sup>2</sup>	90%	70%	83%	86%	91%	87%	86%	85%	85%
RMSE	1.75	4.46	2.72	2.38	2.21	2.28	2.81	2.89	2.60

◆, P < 0.10 ; \*, P < 0.05 ; \*\*, P < 0.01 ; \*\*\*, P < 0.001

- ❖ Microbial phytase supplementation increases the AID of essential amino acids.
- ❖ Dietary PP concentration affected negatively the AID of Arg and tended to affect the AID of Lys and Val.
- ❖ Dietary NDF concentration influenced quadratically the AID of all essential AA excluding His and Met.
- ❖ Only the AID of Arg, Thr and Lys increased with increasing CP level.



Negative impact of NDF on Lys AID, this is the results of antinutritive effects of fiber that cannot be digested by endogenous enzyme secretions (Angkanaporn et al., 1994 ; Ravindran et al., 1999).



Higher effect of Phytase on Thr than Phe AID, this can be the results of reducing endogenous AA losses. Endogenous AA secretions are known to contain high concentrations of Thr (Cowieson et al., 2004 ; Cowieson and Ravindran, 2007).