

Exogenous phytase enhances weight gains and increases ileal amino acid disappearance rates in broiler chickens

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10/09/2020



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Outline

- ◆ Bacterial phytase (Chinese origin)^{*}
- ◆ Trial run at PRF, Sydney University
- ◆ Conclusions

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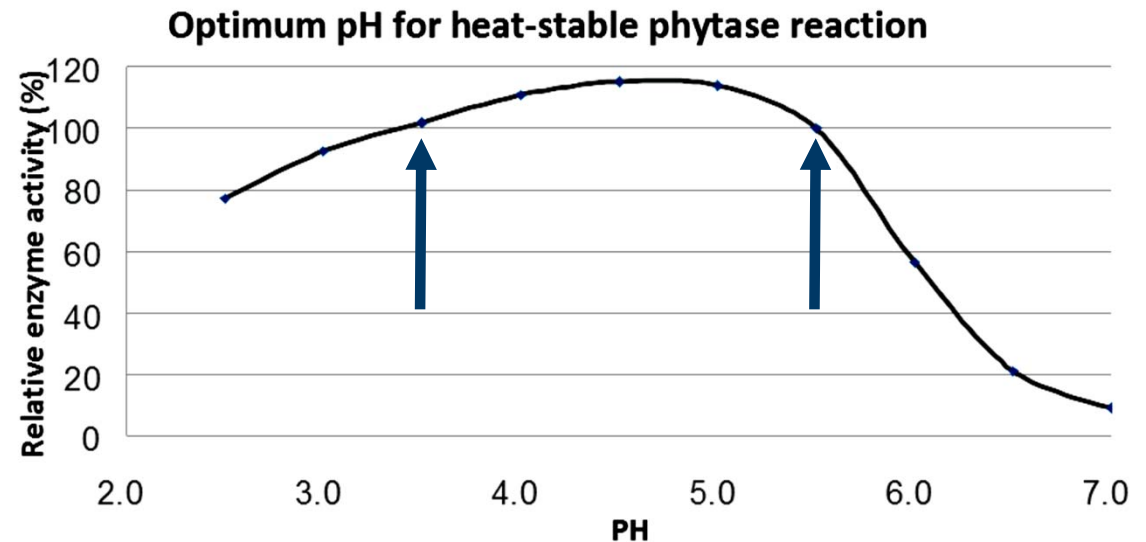


Microtech 10000 Plus



About Microtech 10000 Plus

- ◆ Bacterial 6-phytase (3rd generation)
- ◆ Recombinant gene from *Escherichia coli* expressed in *Pichia pastoris*
- ◆ Peak activity between 3.6 & 5.5 pH
 - ◆ Active over a wide area of the GIT
- ◆ Heat stability (conditioner):
 - ◆ 99.7% @ 75 °C & 76.2% @ 85 °C (North Carolina State University, 2018)



Trial Outline, Sydney University

- ◆ Four treatments
 - ◆ 2 X 2 Factorial: PC & NC, without or 1000 FTU/kg
- ◆ Six replicates per treatment, 40 birds per replicate in floor pens
 - ◆ = a total of 960 Ross 308 off-sex male chicks in 36 pens
- ◆ Feeding period: 1 to 21 days post-hatch
- ◆ Pelleted grower feed, steam conditioned at 80 °C
 - ◆ Feed: typical wheat/SBM-based Australian diet
- ◆ Evonik “ideal” amino acid ratios (AMINODat[®] 5.0)

Composition of experimental diets

Ingredient (g/kg)	Positive Control (PC)	PC + 1000 FTU/kg phytase	Negative Control (NC)	NC + 1000 FTU/kg phytase
Wheat	507	507	525	525
Soybean meal	294	294	290	290
Canola meal	75	75	75	75
Soy oil	66	66	60	60
L-lysine HCl	2.71	2.71	2.76	2.76
D,L-methionine	2.66	2.66	2.63	2.63
L-threonine	1.24	1.24	1.24	1.24
L-valine	0.40	0.40	0.38	0.38
Sodium chloride	2.23	2.23	2.19	2.19
Sodium bicarbonate	2.61	2.61	1.57	1.57
Limestone	6.13	6.13	7.27	7.27
Dicalcium phosphate	17.62	17.62	8.10	8.10
Xylanase	0.05	0.05	0.05	0.05
Phytase	-	0.10	-	0.10
Choline chloride (60%)	0.90	0.90	0.90	0.90
Celite	20.0	20.0	20.0	20.0
Sand	0.10	-	0.10	-
Vitamin-mineral premix	2.00	2.00	2.00	2.00

Composition of experimental diets

Specifications (g/kg)	Positive Control (PC)	PC + 1000 FTU/kg phytase	Negative Control (NC)	NC + 1000 FTU/kg phytase
Metabolisable energy (MJ/kg)	12.77	12.77	12.77	12.77
Crude protein	232	232	232	232
Calcium	7.60	9.20	6.00	7.60
Total phosphorus	6.50	6.50	4.94	4.94
Available phosphorus	3.80	5.10	2.50	3.80
Phytate phosphorus	2.20	2.20	2.21	2.21
Non-phytate phosphorus	4.30	4.30	2.73	2.73
Sodium	1.80	2.10	1.50	1.80
Potassium	9.38	9.38	9.38	9.38
Chloride	2.50	2.50	2.50	2.50
DEB (mEq/kg)	248	261	234	247
Digestible amino acids				
Lysine	12.12	12.12	12.12	12.12
Methionine	5.61	5.61	5.61	5.61
Threonine	8.00	8.00	8.00	8.00
Tryptophan	2.61	2.61	2.61	2.61
Isoleucine	8.24	8.24	8.24	8.24
Leucine	14.38	14.38	14.38	14.38
Arginine	13.08	13.08	13.08	13.08
Valine	9.57	9.57	9.57	9.57

Phytase matrix contribution (g/kg): 1.6 Ca; 1.3 avP and 0.3 Na

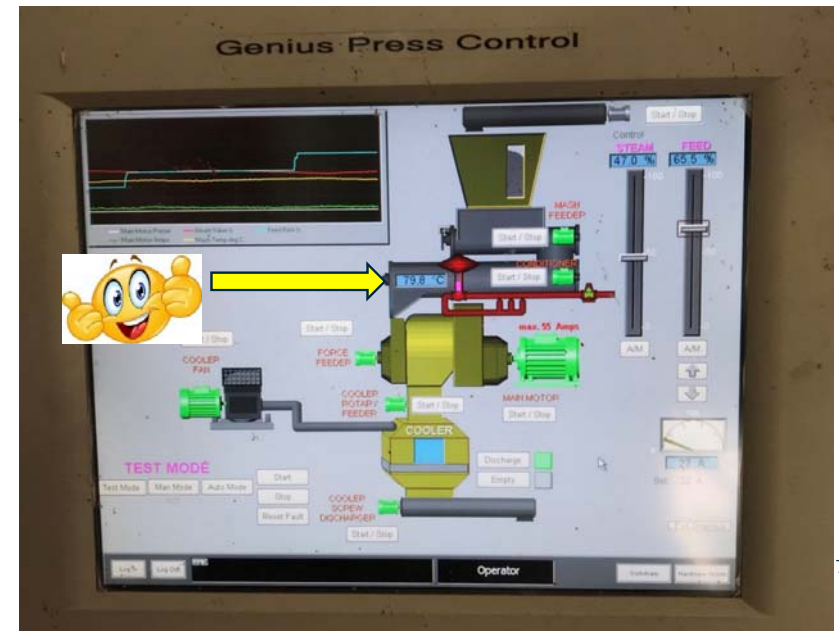
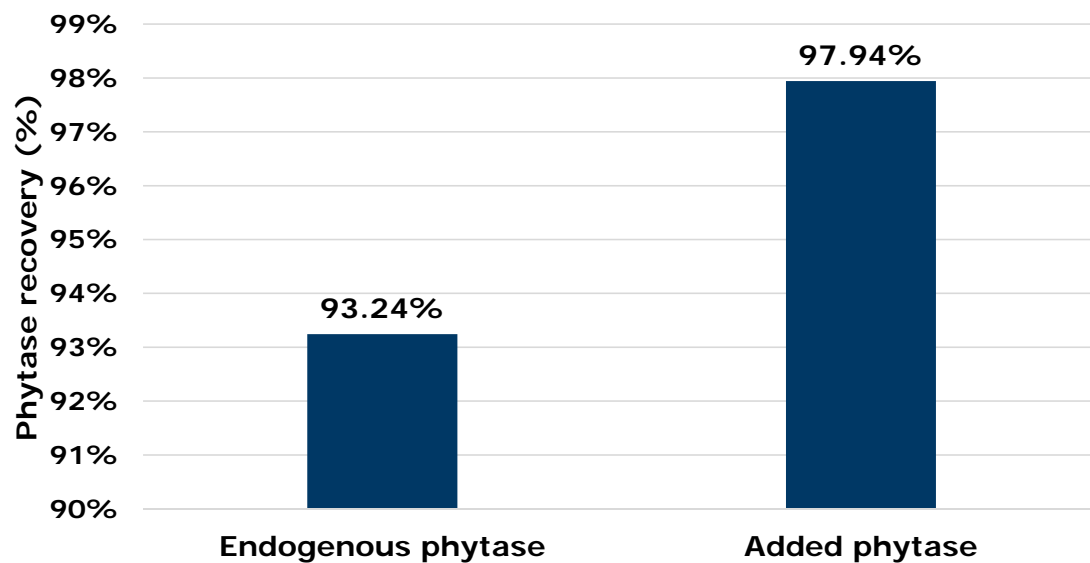
Phytase recovery

◆ Average of phytase levels in pre-pelleted mash

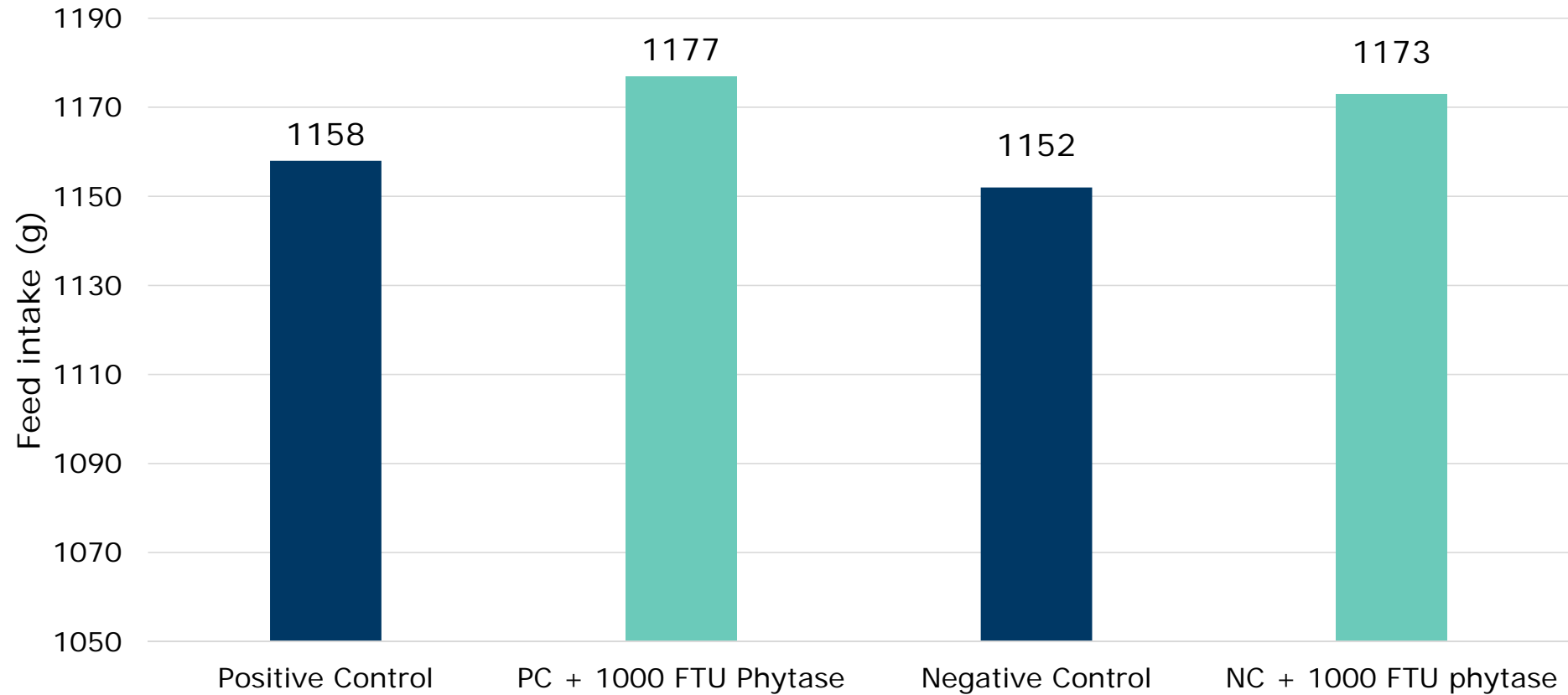
◆ = 370 FTU/kg endogenous; 1118 FTU/kg @1000 supplemental

◆ Steam pelleted at 80 °C; post pelleting recovery:

◆ = 345 FTU/kg endogenous; 1095 FTU/kg supplemental

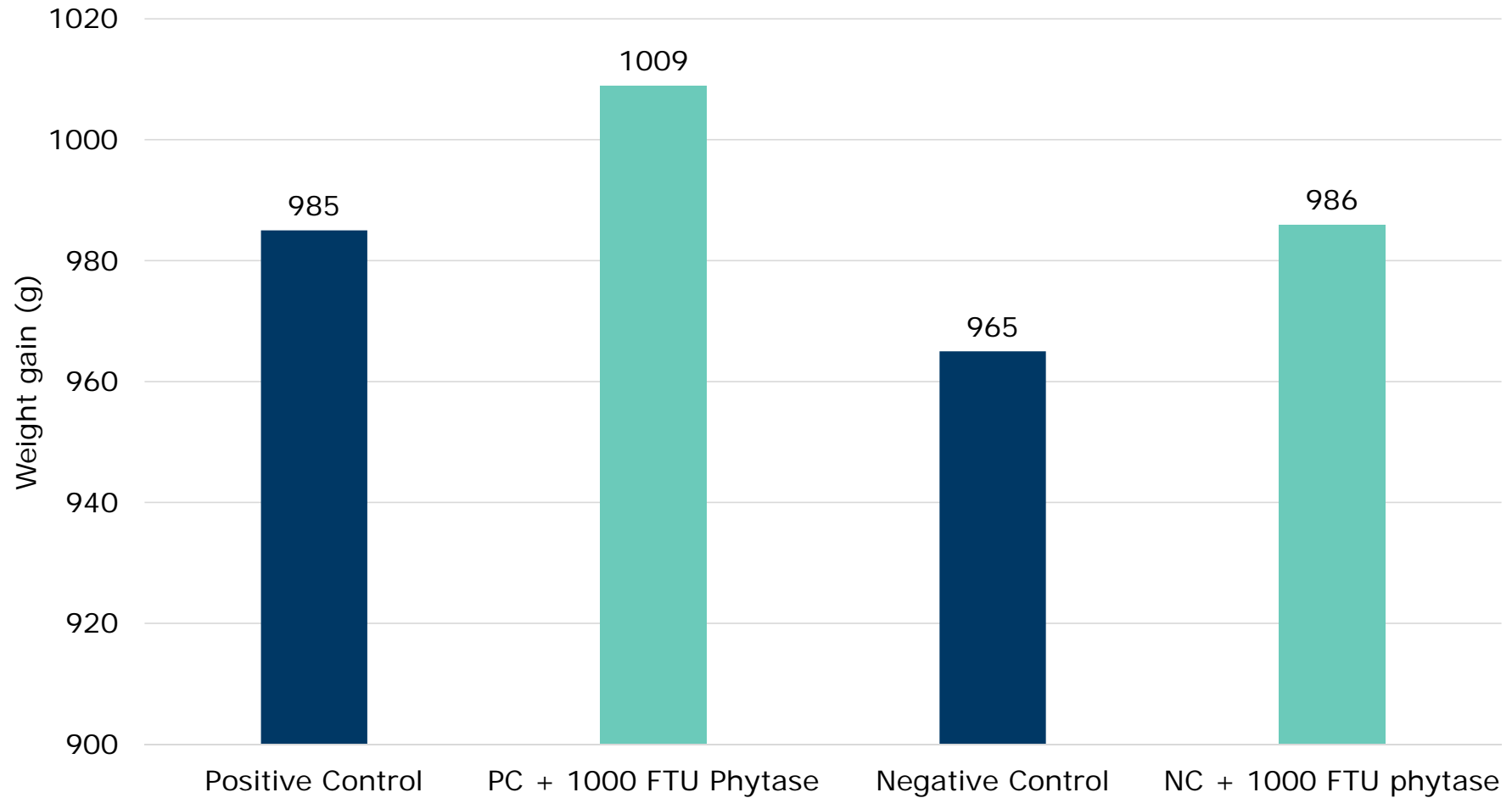


Trial Results: feed intake 1 to 21 days



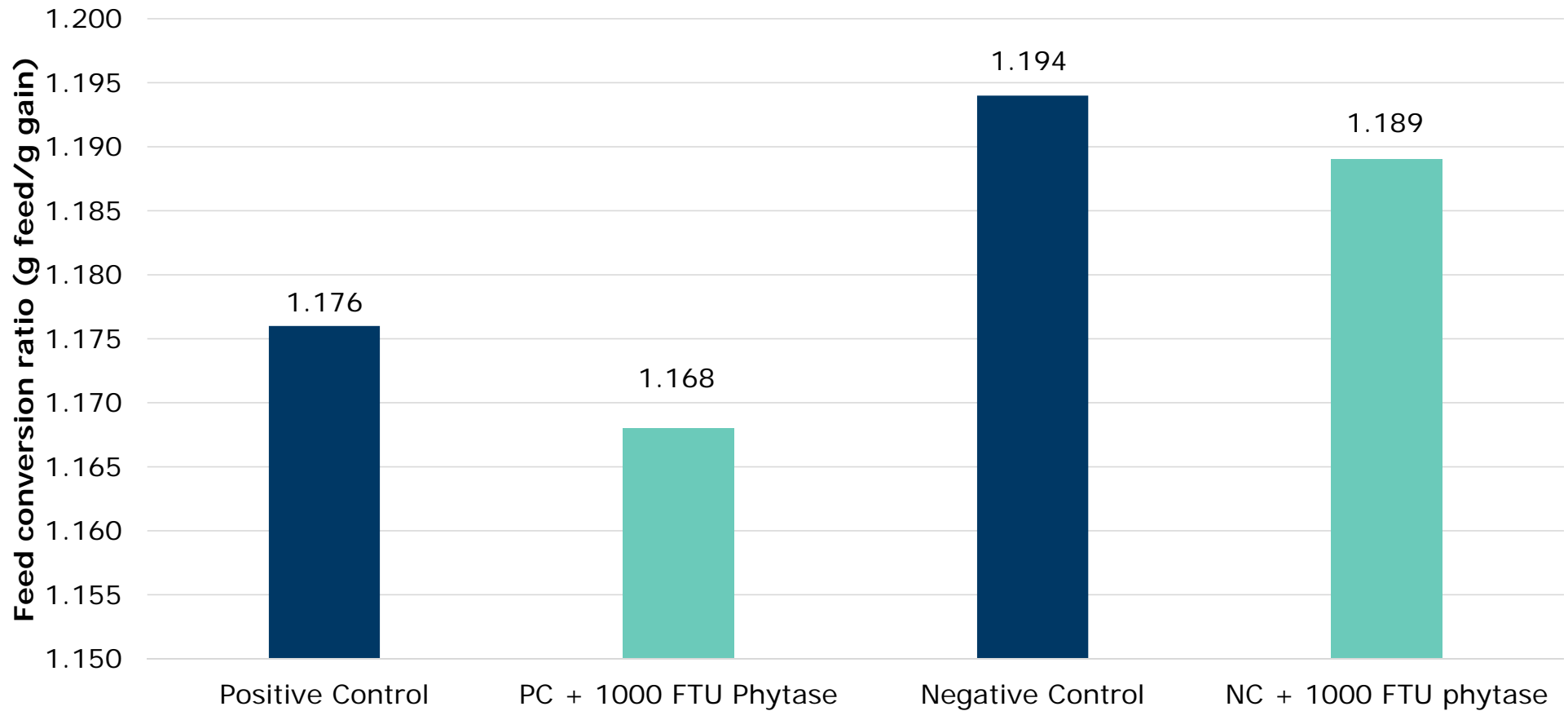
Phytase: $P = 0.035$; Diet $P = 0.543$

Trial Results: weight gain 1 to 21 days



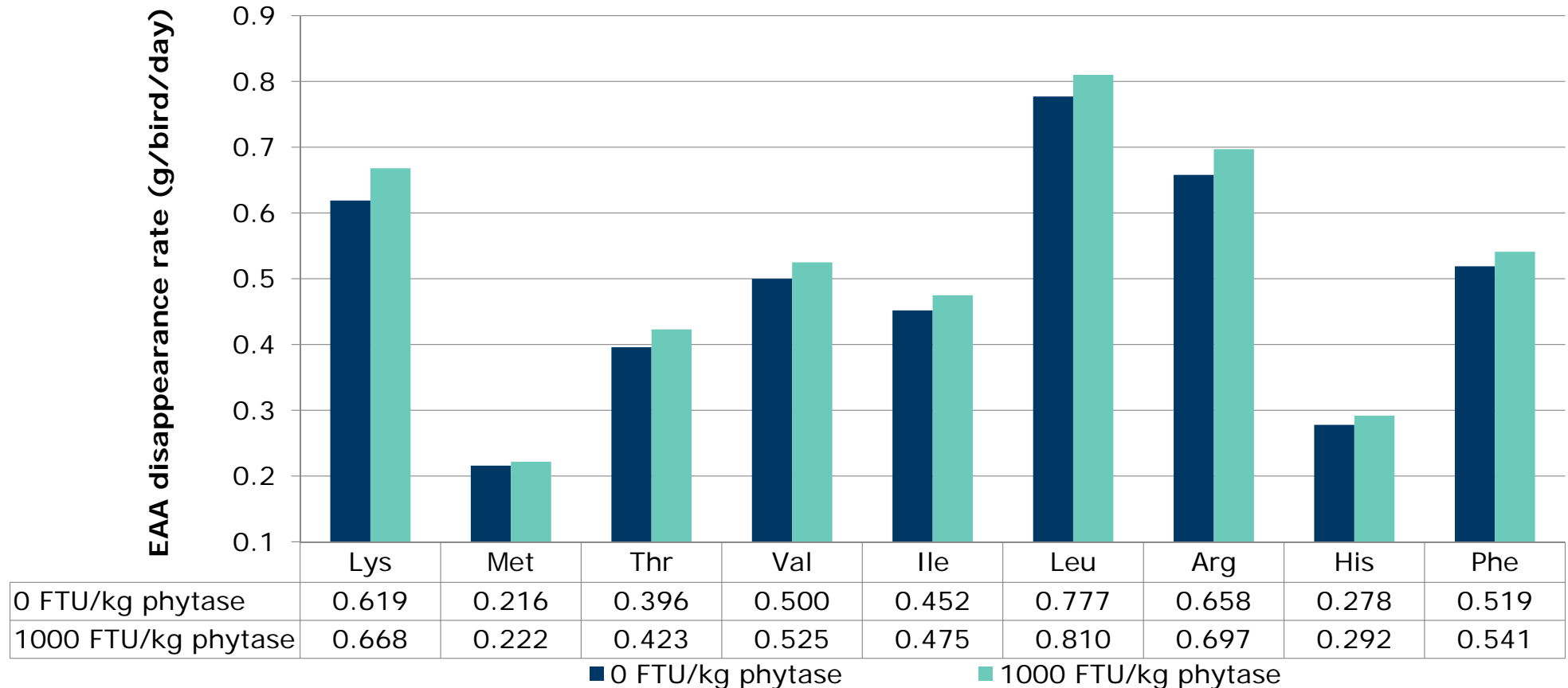
Phytase: ***P* = 0.023**; Diet: ***P* = 0.034**

Trial Results: FCR 1 to 21 days



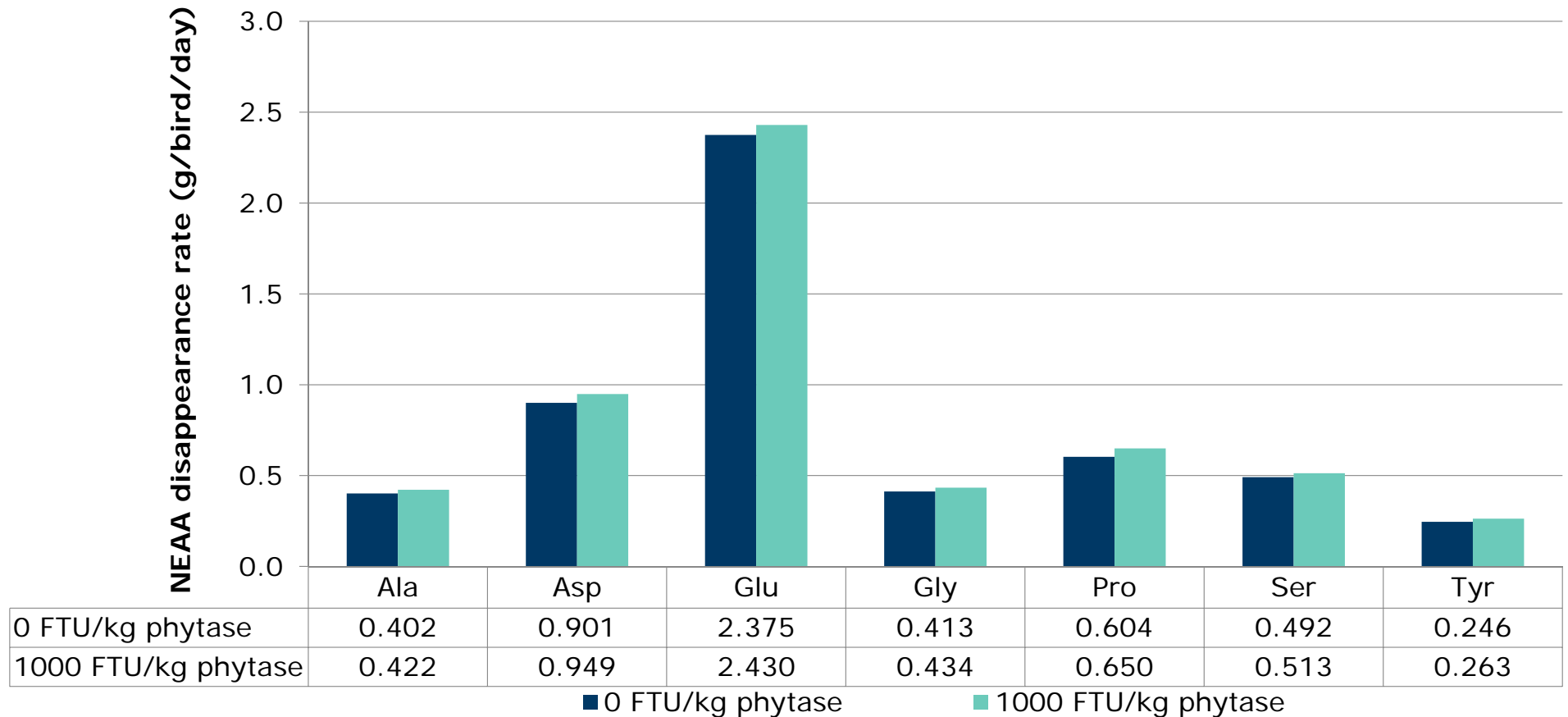
Phytase: $P = 0.296$; Diet: $P = 0.004$

Trial Results: EAA disappearance rates 1 to 21 days



Phytase: $P = 0.031$ (Met); $P = 0.001$ (Leu & Phe); $P < 0.001$ for rest of EAA

Trial Results: NEAA disappearance rates 1 to 21 days



Phytase: $P = 0.016$ (Glu); $P = 0.001$ (Gly & Ser); $P < 0.001$ for rest of NEAA

Conclusions



Limiting factor
(nearest minimum)

Liebig's Law
of the
Minimum,
Sprengel,
1828

- ◆ Phytase increased weight gain by 2.36%
- ◆ Phytase increased feed intake by 1.8%
- ◆ Phytase tended (NS) to improve FCR (uncorrected for liveweight gain)
- ◆ Phytase increased the disappearance rates of AA by 4.67%
- ◆ The NC diet significantly reduced weight gain, feed intake and toe ash
- ◆ Improvements with phytase likely to be AA & AME uplift



Thank you... & Acknowledgements



Baiada



Enhancing poultry performance



- ◆ Ms Joy Gill
- ◆ Mr Wade Chen
- ◆ Ms Kylie Warr
- ◆ Mr Peter Bird



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