



Effect of full matrix application of a novel phytase without or with a multi-enzyme complex containing xylanase, β -glucanase, amylase and protease on performance of piglets

R.Lizardo¹, H.Quesada¹, A.Ghane², G.Nguyen², E.Vinyeta², D.Velayudhan², Y.Dersjant-Li²

¹ IRTA – Animal Nutrition, Centre Mas Bové, TV-7225, Km 3.8, E-43120 Constantí, Spain

² Danisco Animal Nutrition (IFF), Willem Einthovenstraat 4, 2342BG Oegstgeest, The Netherlands



Introduction

- Phytase enzyme catalyses the hydrolysis of phytic acid releasing P and some other nutrients or minerals (Zn, Ca, ...)
- Exogenous phytases increase P retention in pigs allowing a reduction of dietary P concentration so less inorganic P supply is needed, thereby reducing P excretion (into environment) and the cost of the diet.
- Carbohydrases (and proteases) are hydrolytic enzymes which cleave bounds of the complex plant cell wall polysaccharides increasing their utilisation and releasing other nutrients.

Objective

- Validate the full Matrix of Nutrient values of a novel consensus bacterial 6-phytase variant (PhyG) in combination with a multi-enzyme complex (MEC) in piglets fed diets limited in dig P, Ca, AA and energy.
- Growth performance and **cost savings** are used as response criteria.

Animals and Experimental Design

Dietary treatments (PC, NC1+, NC2++)

T1: Control (PC): 4.0 / 3.3 g/kg dig_P

T2: NC1 + 1500 FTU/kg phytase “PhyG”

T3: NC2 + 1500 FTU/kg PhyG + Multienzyme complex “Prime”
(4000 U Xylanase, 200 U β -glucanase, 100 U α -amylase, 2000 U Protease)

2-phase feeding program (PST, STA)

234 male / female Pi*(LW*LR) piglets ; 8.20 $\pm$ 0.037 kg

78 pens : 3 pigs/pen

13 blocks BW & Sex : 26 replicates / treatment

Pellet diets, offered ad libitum

Ingredient composition of diets

Feeding Phase	Prestarter (0-2 wks)			Starter (3-5 wks)		
Ingredient, %	PC	NC1+	NC2++	PC	NC1+	NC2++
Phytase PhyG	-	0.05	0.05	-	0.05	0.05
MEC "Prime"	-	-	0.05	-	-	0.05
Maize	39.1	36.1	33.9	43.0	39.9	38.0
Soybean meal 48%	22.1	20.6	19.6	26.0	23.7	23.7
Rice, broken	10.0	10.0	10.0	12.0	12.0	12.0
Rice bran, fatty	5.0	5.0	5.0	5.0	5.0	5.0
Wheat middlings	7.5	10.0	12.0	8.0	12.0	12.5
Soybean hulls	0.0	3.7	4.7	1.2	4.1	5.5
monoCa phosphate	1.09	0.23	0.23	1.01	0.12	0.11
Limestone	0.75	0.59	0.58	0.70	0.55	0.53
Salt + Na bicarbonate	0.35	0.30	0.30	0.53	0.48	0.48
Whey, sweet, skimmed	11.0	11.0	11.0	-	-	-
Animal fat	1.5	1.0	1.0	1.5	1.0	1.0
Lys, Thr, Met, Trp, Val	1.18	1.12	1.15	0.69	0.69	0.65
Vit + Min premix	0.46	0.46	0.46	0.46	0.46	0.46

Nutrient content of basal diets

Feeding Phase	Prestarter (0-2 wks)			Starter (3-5 wks)		
	PC	NC1+	NC2++	PC	NC1+	NC2++
Phytase, FTU/kg	<100	1500	1500	<100	1500	1500
Xyl, β -glu, amyl, prot, U/kg	-	-	4000, 200, 100, 2000	-	-	4000, 200, 100, 2000
Total P (g/kg)						
Digestible P (g/kg)	4.00	2.24	2.24	3.30	1.46	1.46
Total Ca (g/kg)	8.00	6.07	6.07	7.00	4.99	4.99
Na (g/kg)						
NE (Kcal/kg)	2475	2409	2383	2400	2340	2313
CP (g/kg)						
sid Lys (g/kg)	12.50	12.21	12.15	11.50	11.24	11.18
sid Thr (g/kg)						

Full Matrix Values applied

Feeding Phase	Prestarter (0-2 wks)			Starter (3-5 wks)		
	PC	NC1+	NC2++	PC	NC1+	NC2++
Phytase, FTU/kg	<100	1500	1500	<100	1500	1500
Xyl, β -glu, amyl, prot, U/kg	-	-	4000, 200, 100, 2000	-	-	4000, 200, 100, 2000
	-			-		
Digestible P (g/kg)	-	1.76	1.76	-	1.84	1.84
Total Ca (g/kg)	-	1.93	1.93	-	2.01	2.01
Na (g/kg)	-	0.20	0.20	-	0.20	0.20
NE (Kcal/kg)	-	66.3	93.3	-	60.3	87.3
CP (g/kg)	-	5.13	6.44	-	4.82	6.14
sid Lys (g/kg)	-	0.29	0.35	-	0.26	0.32
sid Thr (g/kg)	-	0.28	0.32	-	0.26	0.30
sid Met (g/kg)	-	0.06	0.06	-	0.06	0.06
sid Trp (g/kg)	-	0.10	0.12	-	0.16	0.17

Nutrient content of experimental diets

Feeding Phase	Prestarter (0-2 wks)			Starter (3-5 wks)		
	PC	NC1+	NC2++	PC	NC1+	NC2++
Phytase, FTU/kg	<100	1500	1500	<100	1500	1500
Xyl, β -glu, amyl, prot, U/kg	-	-	4000, 200, 100, 2000	-	-	4000, 200, 100, 2000
Total P (g/kg)	7.29			6.81		
Digestible P (g/kg)	4.00			3.30		
Total Ca (g/kg)	8.00			7.00		
Na (g/kg)	2.00			2.00		
NE (Kcal/kg)	2475			2400		
CP (g/kg)	181.9			188.2		
sid Lys (g/kg)	12.50			11.50		
sid Thr (g/kg)	8.37			7.71		
sid Met (g/kg)	4.74			4.01		
sid Trp (g/kg)	2.50			2.19		

Animals and Experimental Design

Dietary treatments (PC, NC1+, NC2++)

2-phase feeding program (PST, STA)

234 male / female Pi*(LW*LR) piglets ; 8.20 ± 0.037 kg

13 blocks BW / Sex

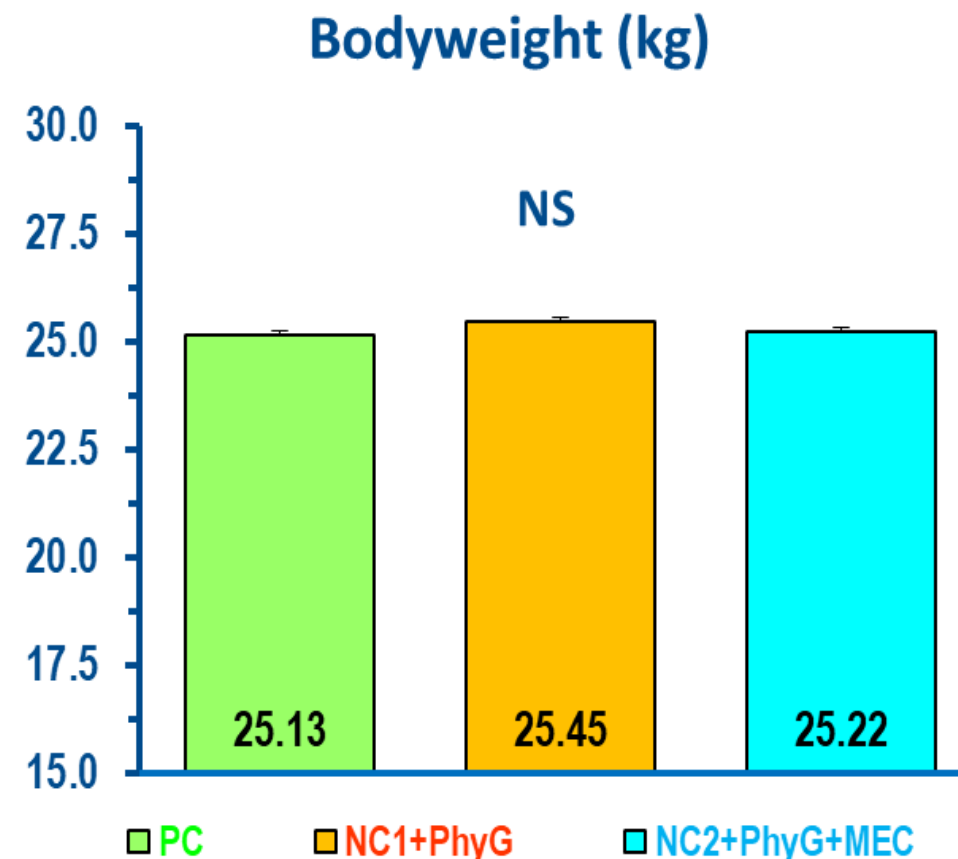
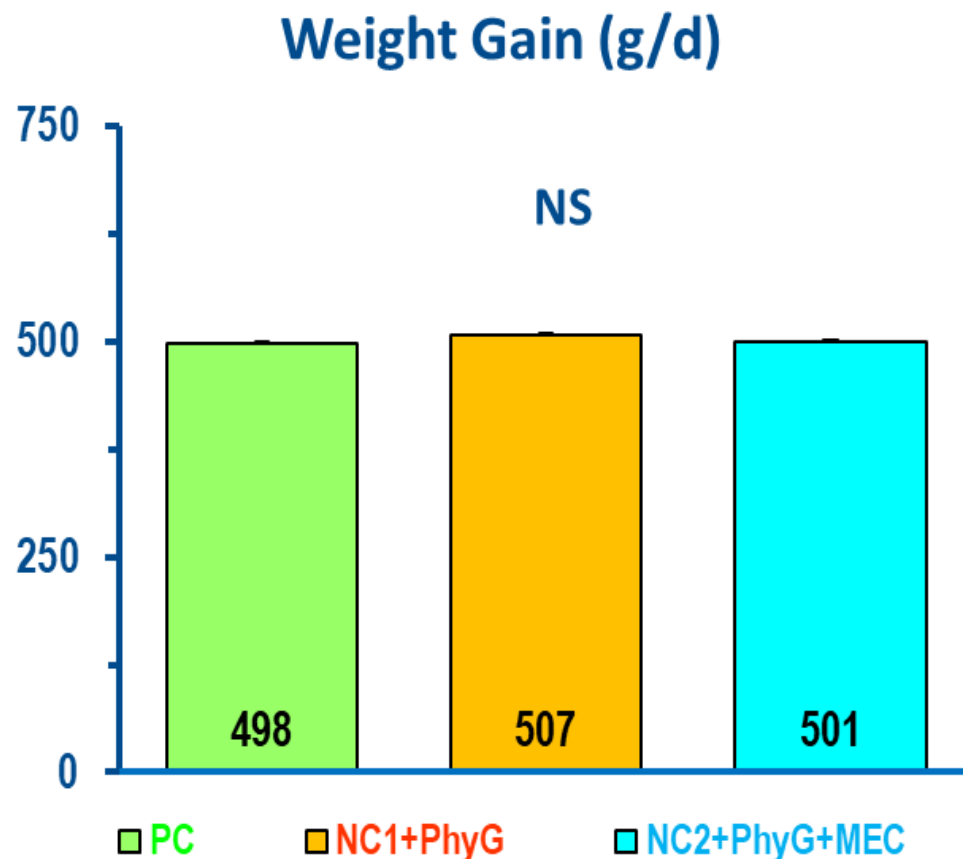
26 replicates / treatment

78 pens : 3 pigs/pen

Pellet diets, offered *ad libitum*

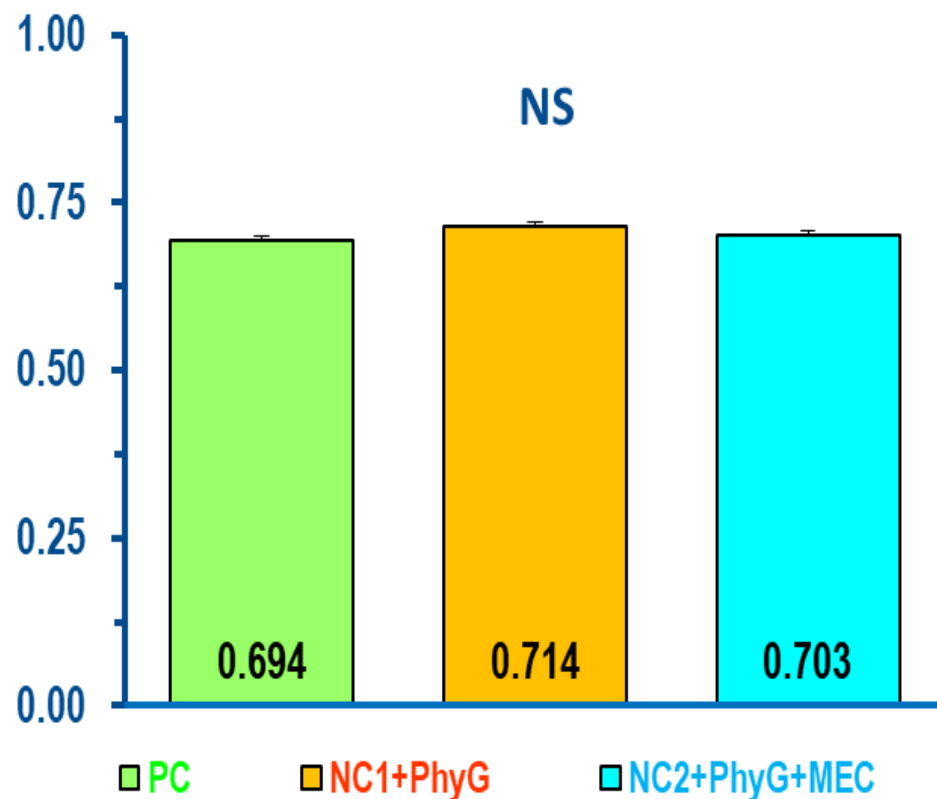
Performance after 5 week (2 phases: 0-2, 3-5, 0-5 weeks)

Piglet Growth Performance

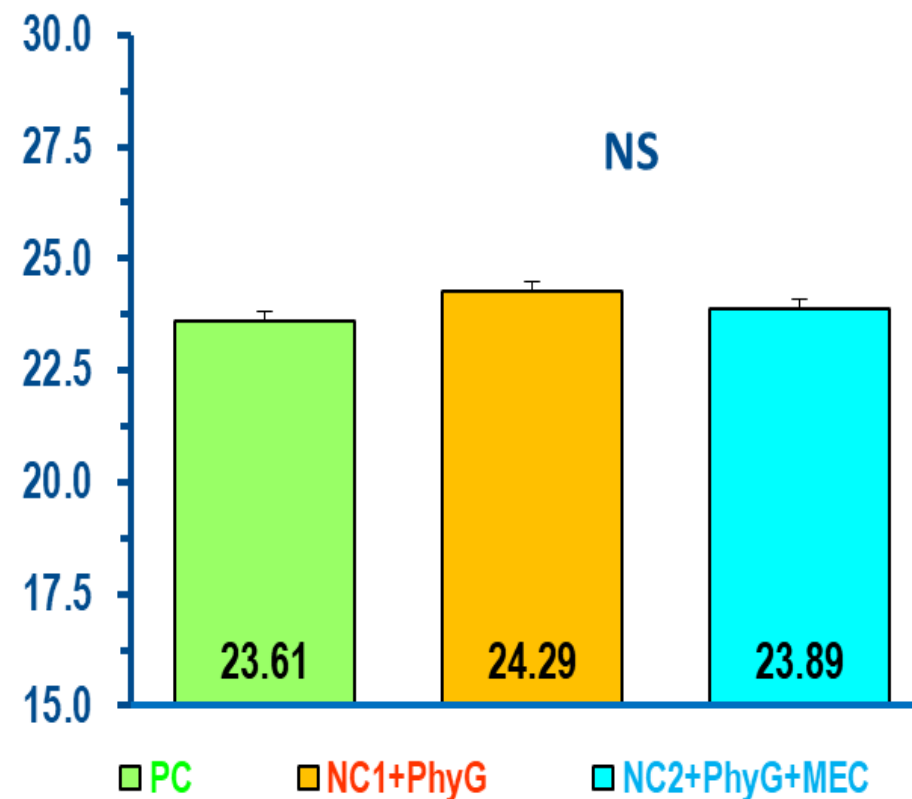


Overall Feed Intake

Feed Intake (adFI, kg/d)

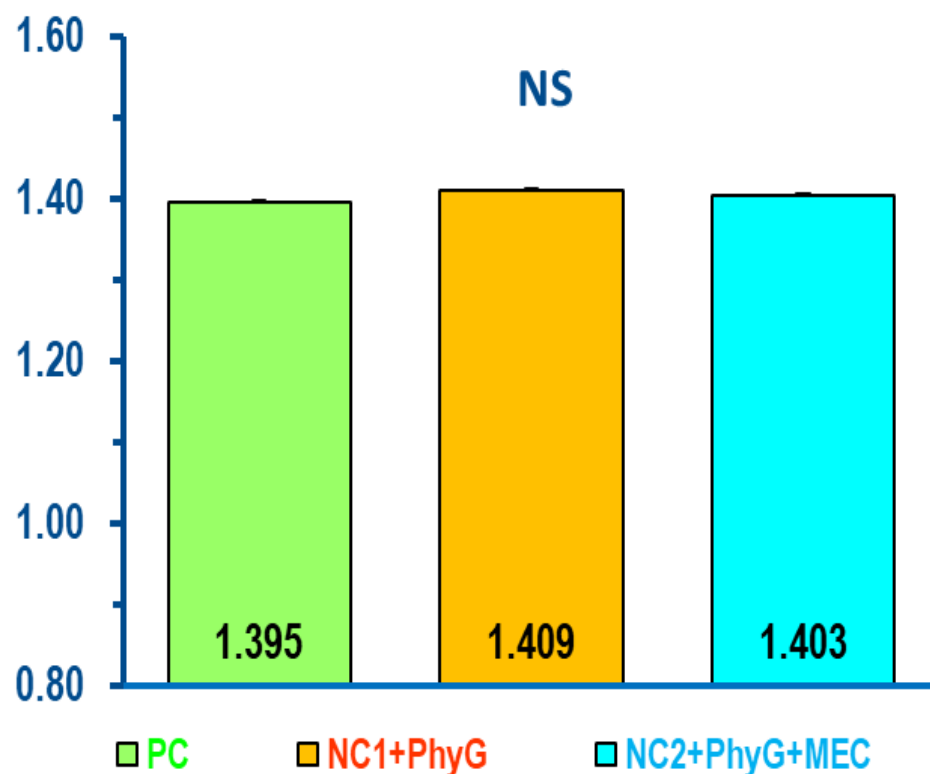


Total Feed (kg/pig)

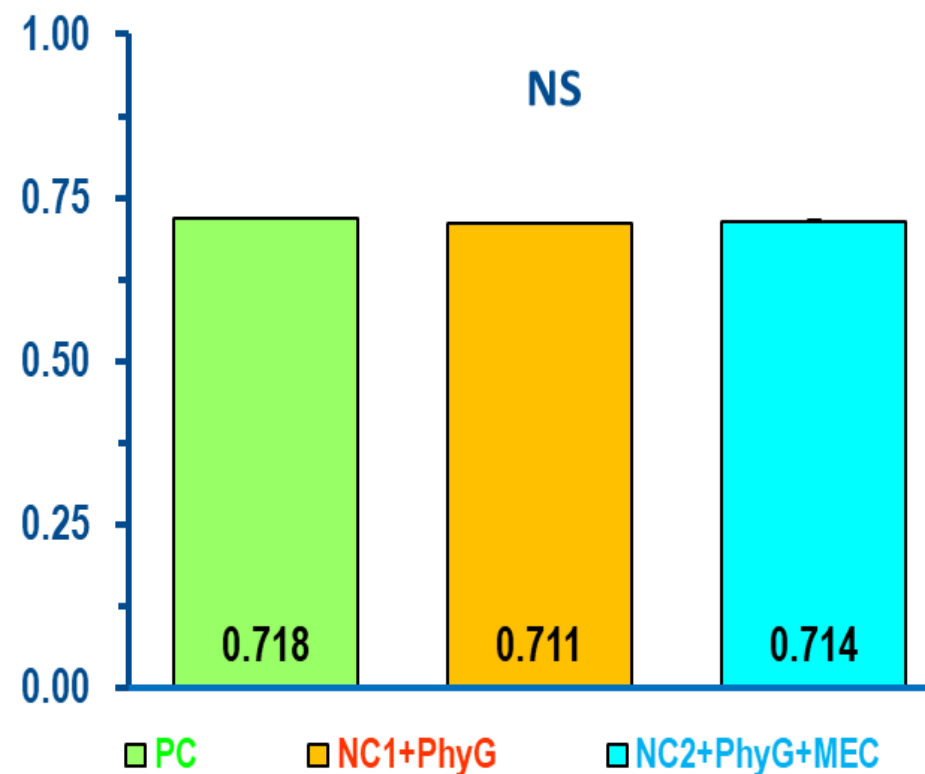


Feed Efficacy

Feed Conversion Ratio



Gain to feed (kg/kg)



Economic evaluation

	PC	NC1 + PhyG	NC2 + PhyG + MEC
Feed Cost (€ /pig)	9.814	9.421	9.161
Savings, %		4.01%	6.65%
Cost (€ / kg BW)	0.580	0.546	0.538
Savings, %		5.75%	7.16%
ej., 100,000 piglets "15kg"			
Difference		T1-T2	T1-T3
Cost (€ / kg BW)		0.033	0.042
Savings, €		50,046 €	62,301 €

Take home message

- Supplementation with the novel phytase “PhyG” and “MEC” in diets limited in dig P, Ca, sid AA and Net Energy can result in performance equivalent to that of piglets fed more expensive nutrient adequate diets.
- The full Matrix of Nutrient values in piglet diets is validated
- helping to formulate more sustainable and cheaper diets, while maintaining performance and reducing the environmental impact.

75th EAAP 2024, Florence, Italy



Thank you very much
for your attention

rosil.lizardo@irta.cat



IRTA

Generalitat
de Catalunya