PHYTASE, XYLANASE, AND PROTEASE USE IN A WHEAT DDGS AND RAPESEED DIET FOR FINISHER PIGS

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Introduction

- **Phytase:** ↑ digestibility of phosphorous (P)
- **Carbohydrases:** ↑ digestibility of non-starch polysaccharides (NSP)
- **Protease:** ↑ digestibility of protein

WHAT IS KNOWN IN PIGS:

- Well known effect of phytase on P digestibility
- Inconsistent results with carbohydrases
- Protease not included regularly in finisher diets

Interactions between them?

Introduction

Hypothesis

- ✓ Supplementation of **enzymes** into by-product (RSM and wheat-DDGS) based diets can **improve feed efficiency** in finisher pigs
- ✓ **Interactions** between phytase, carbohydrase and protease can modify their **individual supplementation** effect

Objective:

- ✓ Establish the **combination of feed enzymes** that optimise **feed efficiency** in finisher pigs

Material and Methods

- 162 pigs, MaxGrow™ x (LWxLandrace; Hermitage Genetics)
- 81 same sex pen pairs into 9 treatments (n=9 pens/treatment)
- Age: 42 days pw (38.8 ± 2.90 kg)
- Duration: 76 days

- Recordings:
  - Body weight and feed intake 2-3 weeks
    - ADG (g/day), ADFI (g/day), FCR (g/g)
  - Slaughter:
    - Kill out %, carcass weight, fat depth, muscle depth and lean %,

Material and Methods

- **DIETARY TREATMENTS:**

1) **Positive control (PC):** exceeds NRC (2012) requirements
2) **Negative control (NC):** basal diet with 5% reduction in energy and amino acid levels
3) **NC + Heat stable phytase**
4) **NC + Xylanase and β-glucanase complex (Xβ)**
5) **NC + protease**
6) **NC + phytase + protease**
7) **NC + phytase + Xβ**
8) **NC + Xβ + protease**
9) **NC + phytase + Xβ + protease**

Phytase (Phyzyme XP, DuPont), Xβ (Rovabio Spiky, Adisseo), Protease (Ronozyme ProAct, DSM)

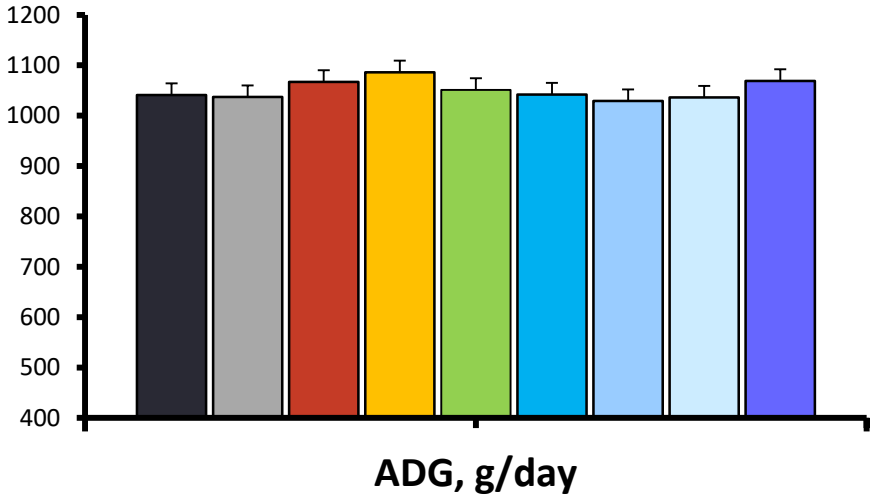
Material and Methods

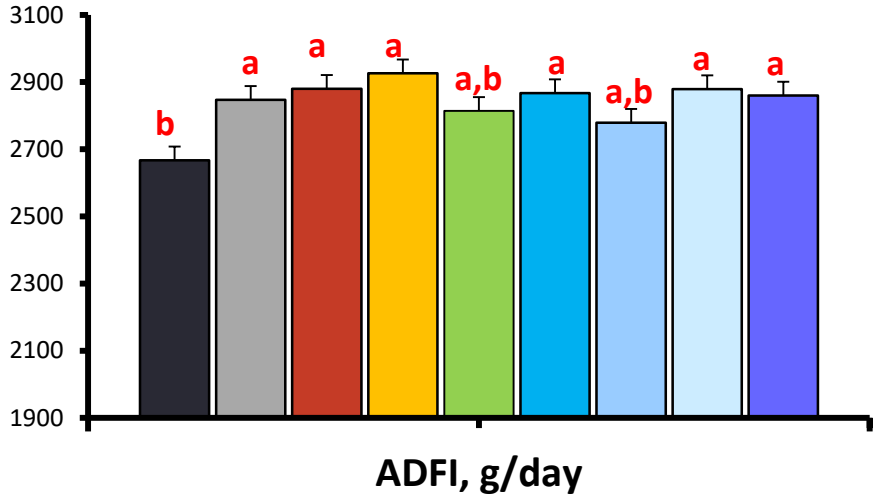
	T1	T2	T3	T4	T5	T6	T7	T8	T9
Phytase, g/tone	-	-	100	-	-	100	100	-	100
Carbohydrase, g/tone	-	-	-	100	-	-	100	100	100
Protease, g/tone	-	-	-	-	200	200	-	200	200
Net Energy, MJ/kg	9.9	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4
Av. Lysine, g/kg	0.83	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
P:Ca, g/g	0.85	0.85	0.83	0.85	0.85	0.83	0.83	0.85	0.83
Av. Phosphorus, g/kg *Phytase sparing effect*	0.30	0.30	0.22 *+0.15*	0.30	0.30	0.22 *+0.15*	0.22 *+0.15*	0.30	0.22 *+0.15*

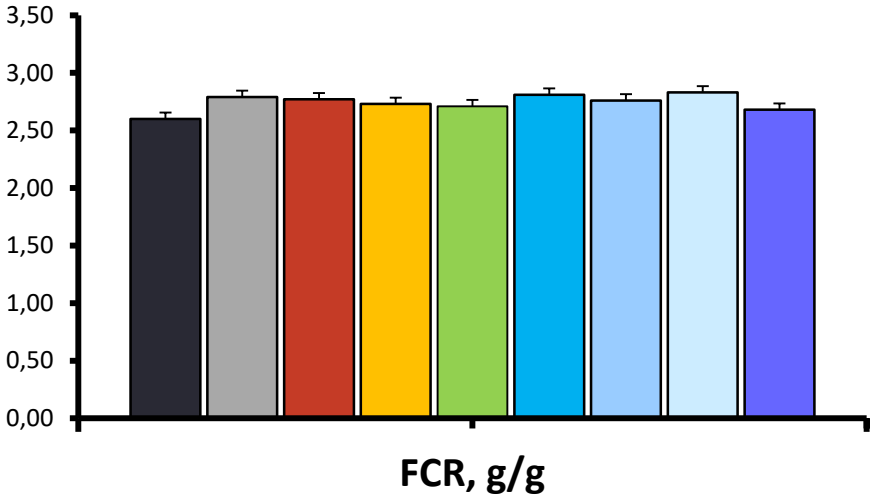
*Calculated composition

- ✓ **Diets based on Rapeseed meal (9.6-10%), wheat (30-39%), barley (35-38%) and wheat DDGS (20%)**
- ✓ **Balanced amino acid profile**
- ✓ **Enzymes premixed with 10 kg of wheat**

Results



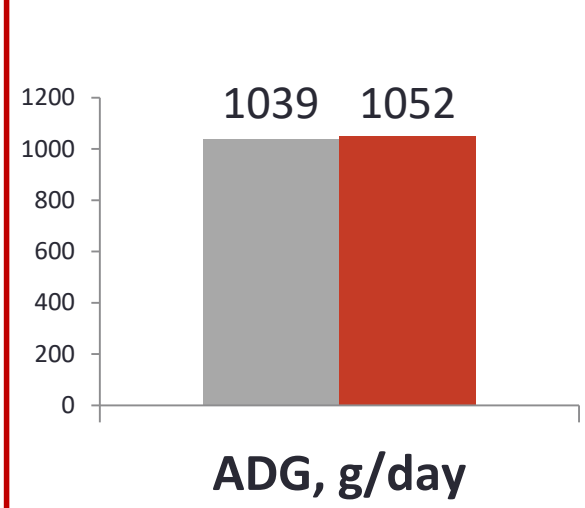


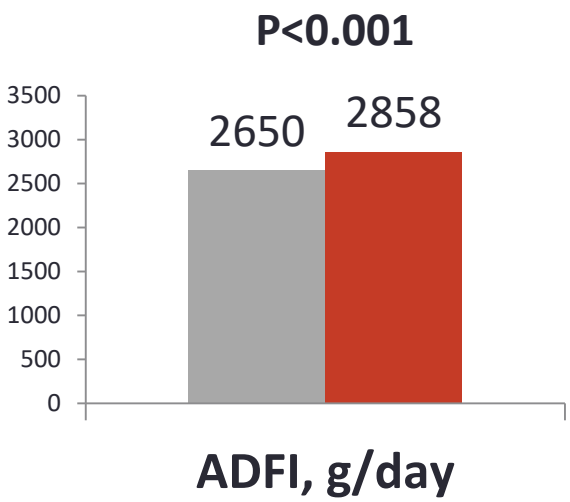


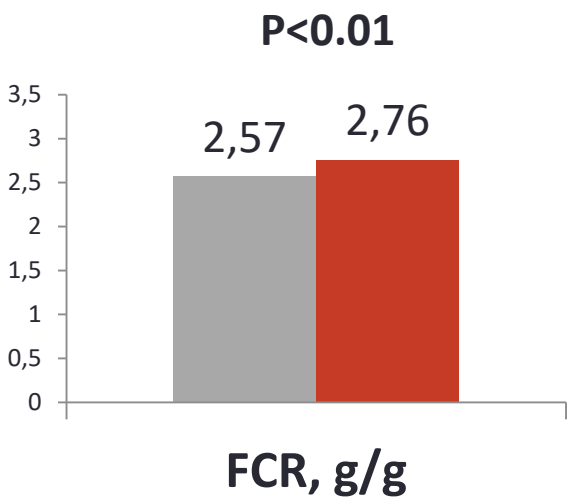
- T1, Positive control
- T2, Negative control
- T3, NC+Phytase
- T4, NC+Carbohydrase (Xβ)
- T5, NC+Protease
- T6, NC+Phytase+Protease
- T7, NC+Phytase+Xβ
- T8, NC+Xβ+Protease
- T9, NC+Phytase+Xβ+Protease

Results

Effect of diet density on growth performance



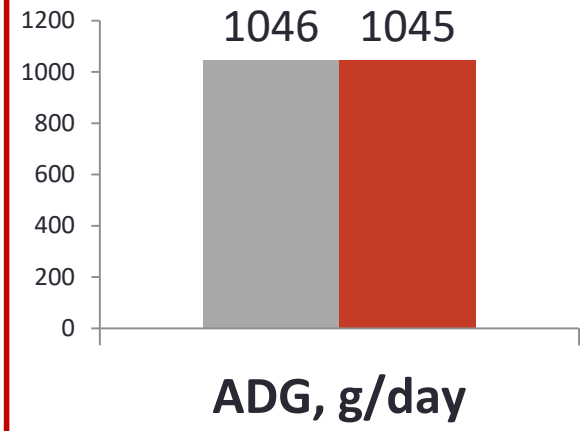




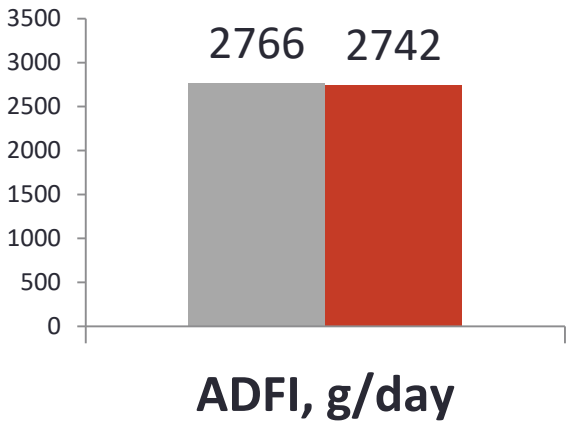
Positive Control Negative Control

Results

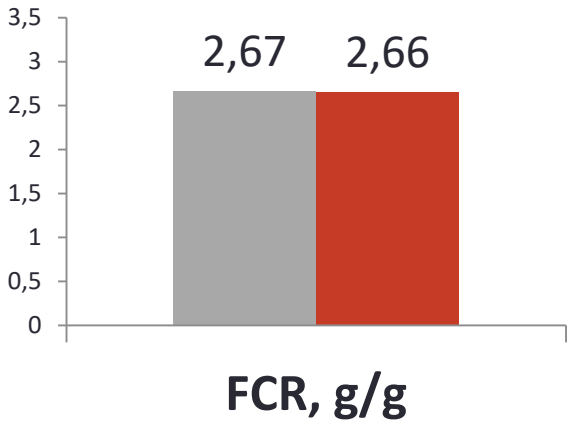
Sparing effect of phytase on growth performance



ADG, g/day



ADFI, g/day



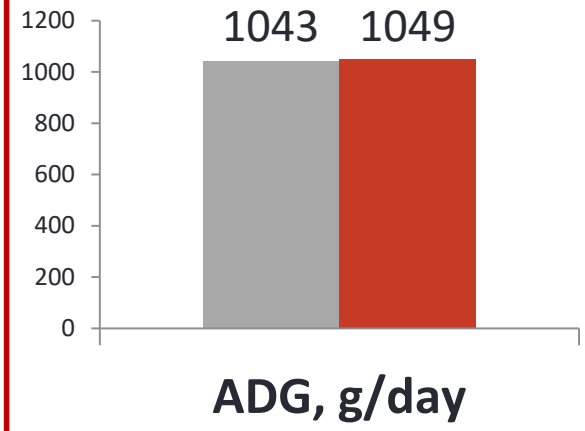
FCR, g/g

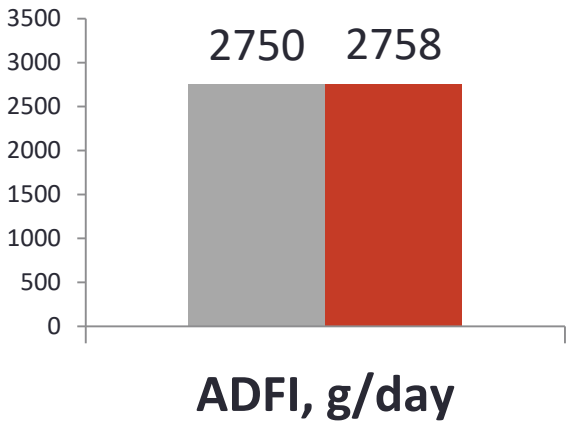
Optimum P and Ca

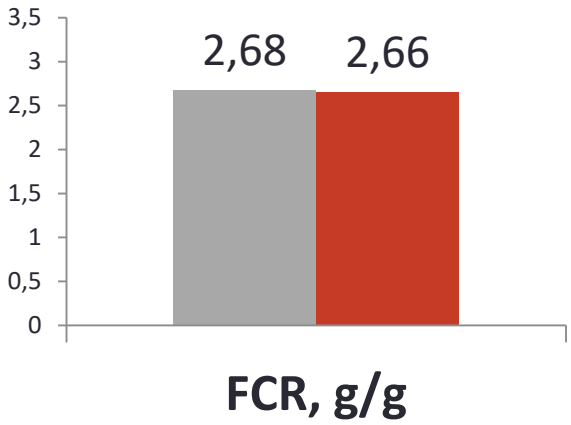
Low P and Ca + Phytase

Results

- **Effect of Xβ on growth performance**



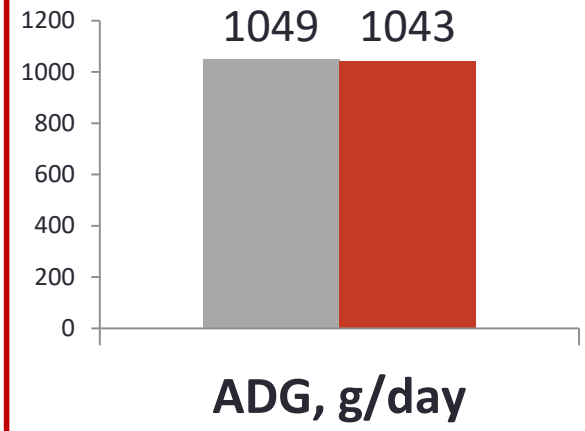




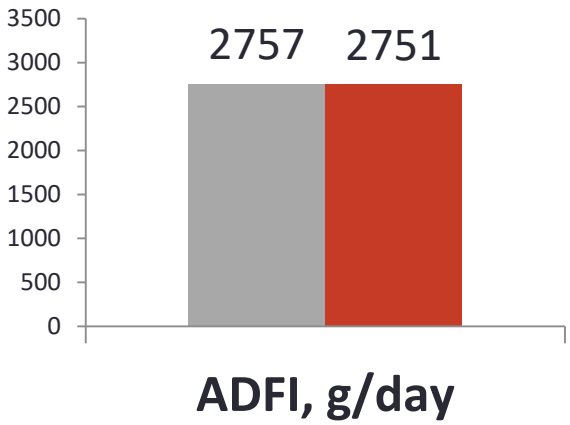
CONTROL + Xβ

Results

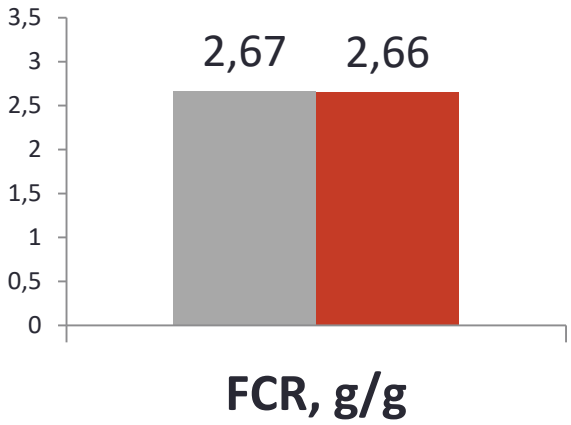
Effect of protease on growth performance



ADG, g/day



ADFI, g/day

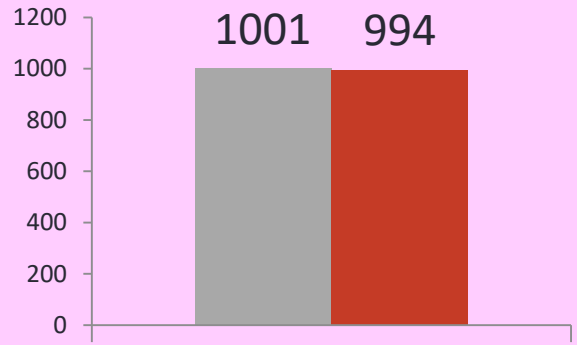


FCR, g/g

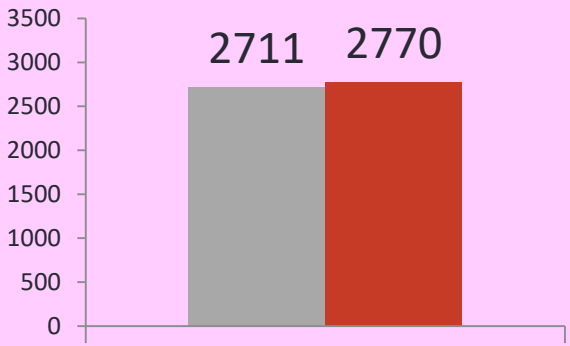
Interaction between protease effect and sex

Control + Protease

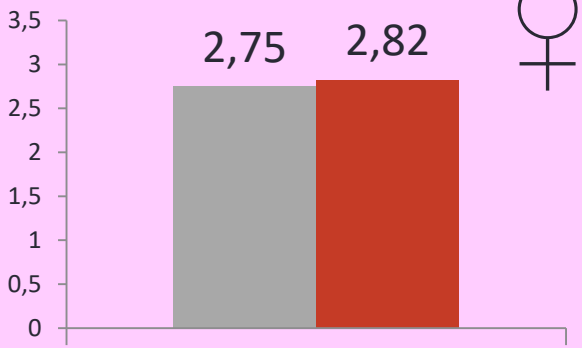
Effect of protease on growth performance



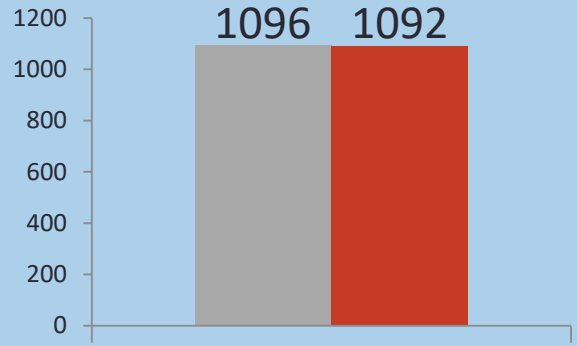
ADG, g/day



ADFI, g/day

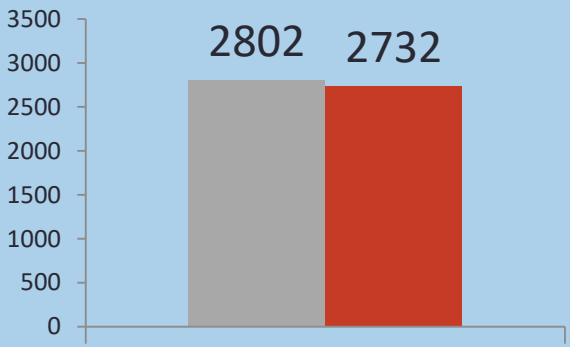


FCR, g/g



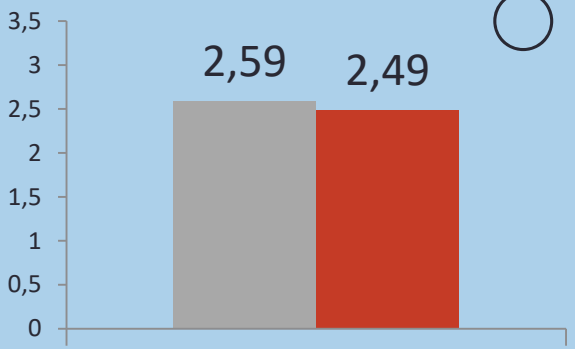
ADG, g/day

P < 0.05



ADFI, g/day

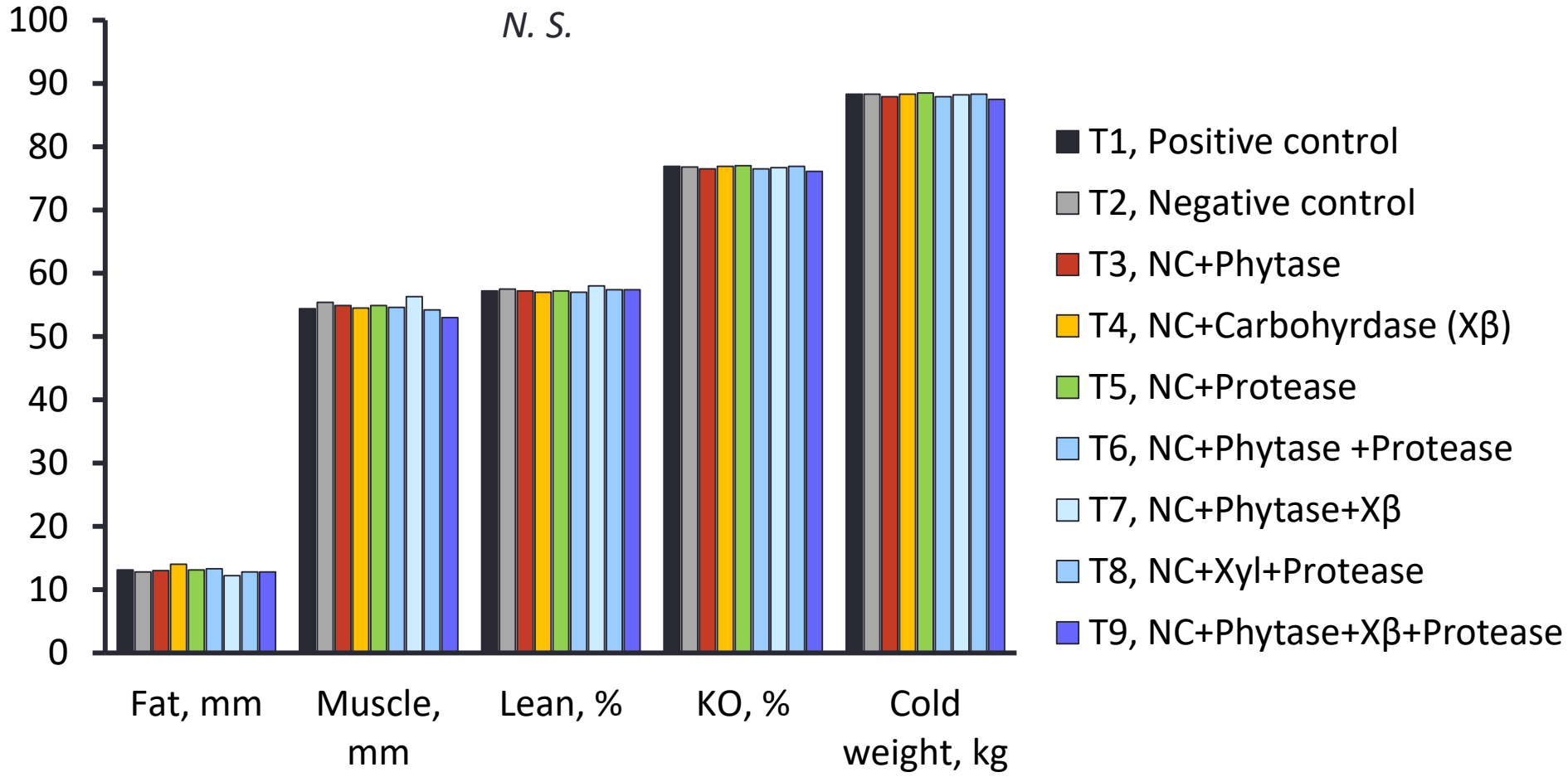
P < 0.05



FCR, g/g

Control + Protease

Results – Carcass parameters



Conclusions

- ↓ 5% in energy and AA on a commercial Irish diet might not be sufficient to see the potential of feed enzymes
- Phytase: the sparing effect for P and Ca was effective
- Xylanase and β-glucanase complex: did not improve FCR
- Protease: has potential to improve feed efficiency in males
- Excellent performance without soya
  - Sister trial presented at Session 03 (M.M.E. Ball *et al.*)

Acknowledgements

- ECO-FCE project (7th FP-EU) & partners
- Teagasc Walsh fellowship programme
- Co-workers from the Teagasc pig department & IRTA & WIT

Thank you

EFFICIENT & ECOLOGICALLY-FRIENDLY PIG AND POULTRY PRODUCTION.

ECOFCE

A WHOLE-SYSTEMS APPROACH TO OPTIMISING FEED EFFICIENCY AND REDUCING THE ECOLOGICAL FOOTPRINT OF MONOGASTRICS.

BASIC DATA

Funding:
EU-FP7
(€ 6 million)

Start date:
1 February 2013

Duration:
48 months
(2013 to 2017)