α-galactosidase and xylanase in fattening pigs fed diets with soybean and rapeseed meals

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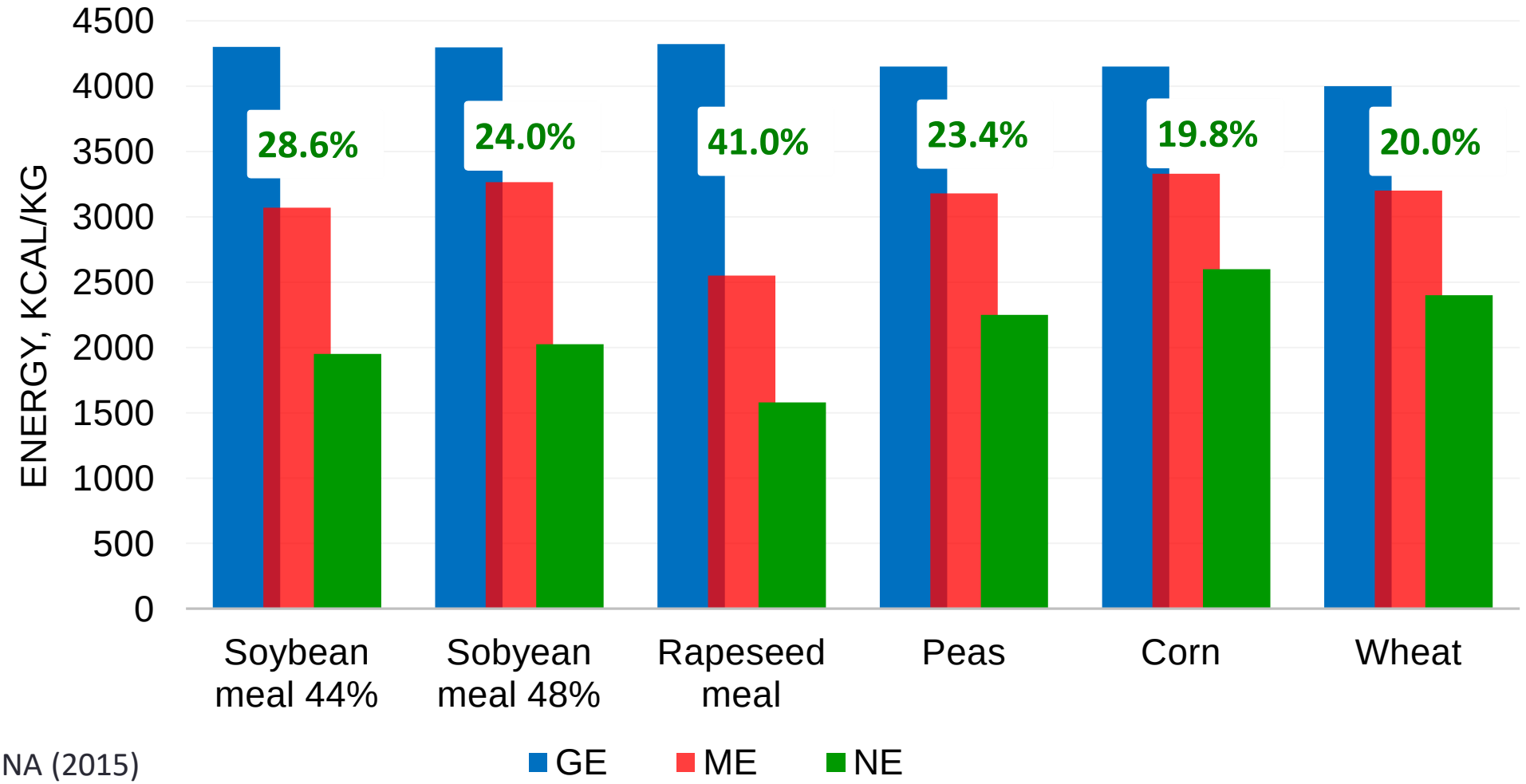
This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement No. 311794.

Energy digestibility in pigs



Source: FEDNA (2015)

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Antinutritional factors in legume meals

- Oligosaccharides (15%)
  - α-galactosides (raffinose, stachiose,...) (7-8%)
  - sucrose (6-7%)

Soluble

- Non-starch polysaccharides (NSPs)

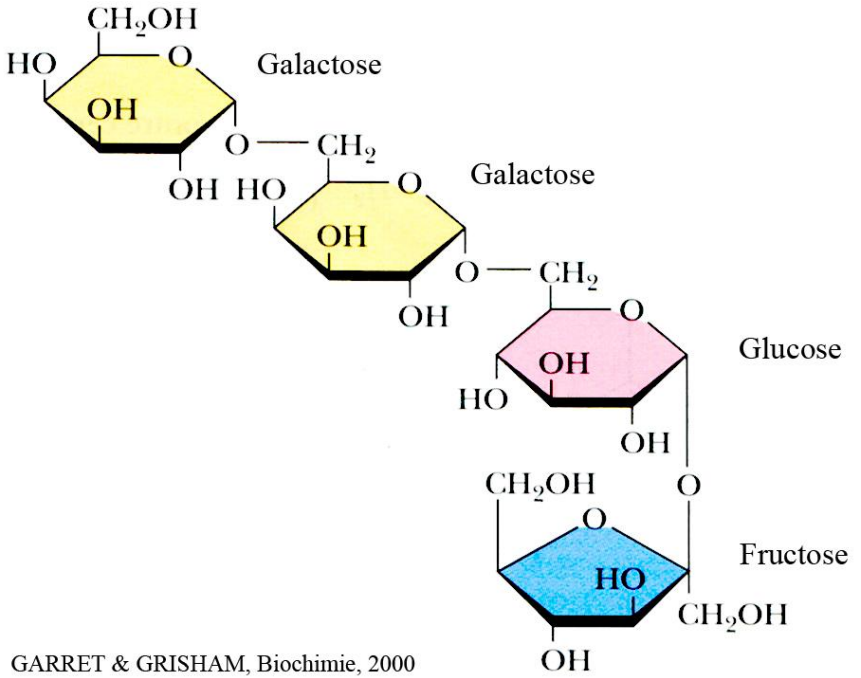
Non-cellulosic polymers (15%)
- Arabinoxylans
- Pectins
- β-Glucans
- Mannans

Partially soluble (~50%)

Cellulose (8%)

Insoluble

- Phytic acid (<3%)
- Trypsin inhibitors
- Resistant starch



GARRET & GRISHAM, Biochimie, 2000

α-galactoside

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Objectives

- To test the effect of combining α-galactosidase and endo-1,4-xylanase on the performance of growing-fattening pigs fed diets with soybean meal (SBM) and rapeseed meal (RSM).
- 2 doses of enzyme preparation: 300 vs 500 g/MT (*40,000 GALU/g; 50,000 AXC/g*).
- Added on top or with a 3% restriction in diet NE.

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Materials & Methods

- 2 trials: 72 pigs per trial (36 entire male + 36 female pigs ([Duroc x Landrace] x Pietrain).
- Individually housed; blocked by BW and sex.
- 26 kg BW and 10 weeks of age.
- 3 pelleted diet specifications:
  - Grower-1 (d 0-34); 9.67 MJ NE/kg; 9.0 g SID-Lys/kg.
  - Grower-2 (d 34-69); 9.54 MJ NE/kg; 7.6 g SID-Lys/kg.
  - Finisher (d 69-100); 9.54 MJ NE/kg; 7.0 g SID-Lys/kg.

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Materials & Methods

- Animals were weighed and feed intake registered at 0, 28, 63 and 100 d of trial. Feed efficiency calculated.
- *Trial 2:* Carcass yield at slaughter.

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Trial 1 – Diets

Ingredients	Grower-1		Grower-2		Finisher	
	SBM	RSM	SBM	RSM	SBM	RSM
Wheat	**37.67**	**31.45**	**40.82**	**34.61**	**41.96**	**35.71**
Barley	**40.00**	**40.00**	**40.00**	**40.00**	**40.00**	**40.00**
Soybean meal, 44% CP	**18.09**	**13.14**	**16.31**	**11.36**	**15.57**	**10.63**
Rapeseed meal	**-**	**10.00**	**-**	**10.00**	**-**	**10.00**
Lard	1.25	2.68	0.32	1.74	0.16	1.58
DCP	1.14	0.99	0.85	0.70	0.85	0.70
$CaCO_3$	0.52	0.46	0.64	0.59	0.52	0.46
Salt	0.44	0.43	0.41	0.40	0.39	0.38
L-Lysine-HCl	0.31	0.31	0.18	0.18	0.12	0.12
L-Threonine	0.09	0.07	0.02	-	-	-
DL-Methionine	0.07	0.05	0.03	0.01	0.01	-
L-Tryptophane	0.00	0.00	-	-	-	-
Ethoxyquin	0.02	0.02	0.02	0.02	0.02	0.02
Minerals & vitamins	0.40	0.40	0.40	0.40	0.40	0.40

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Trial 1 - Treatments

- **T-1:** Control SBM (no enzyme)
- **T-2:** Control SBM + Enzyme preparation (300 g/Tm)*
- **T-3:** Control SBM + Enzyme preparation (500 g/Tm)*
- **T-4:** Control SBM-RSM (no enzyme)
- **T-5:** Control SBM+RSM + Enzyme preparation (300 g/kg)*
- **T-6:** Control SBM+RSM + Enzyme preparation (500 g/kg)*

**Enzyme activity: 40,000 GalU/g; 50,000 AXC/g*

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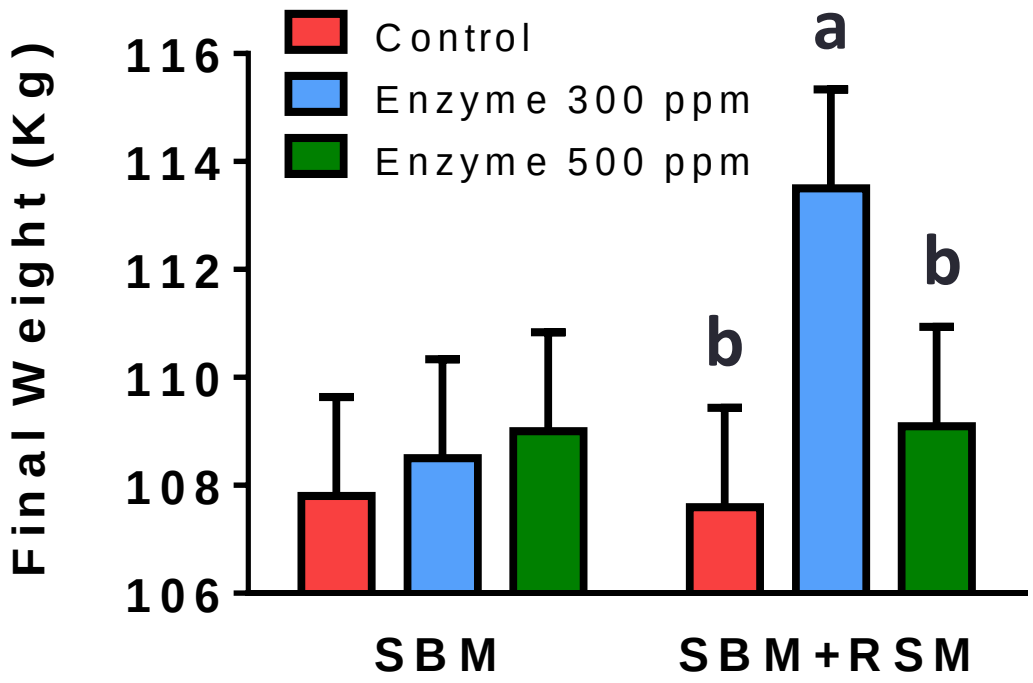
Trial 1 - Body weight (kg)



a, b $P<0.05$

- Increase of bodyweight (107 vs. 109 kg).
- Similar performance for SBM and RSM except for T-4 (SBM-RSM diet with 300 g/MT enzyme).
- T-4: 107 vs. 113 kg.

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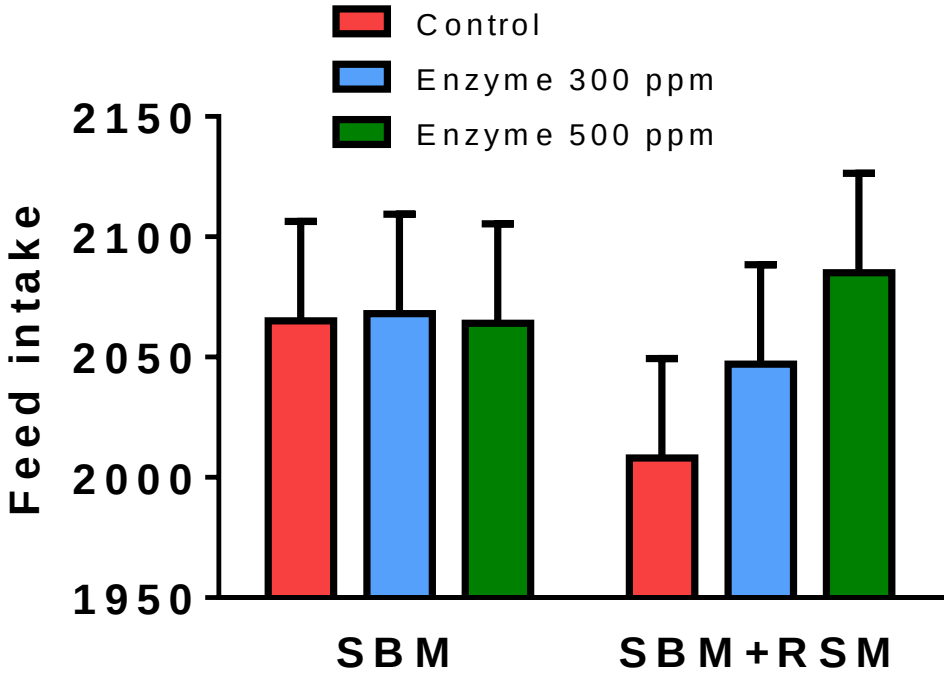
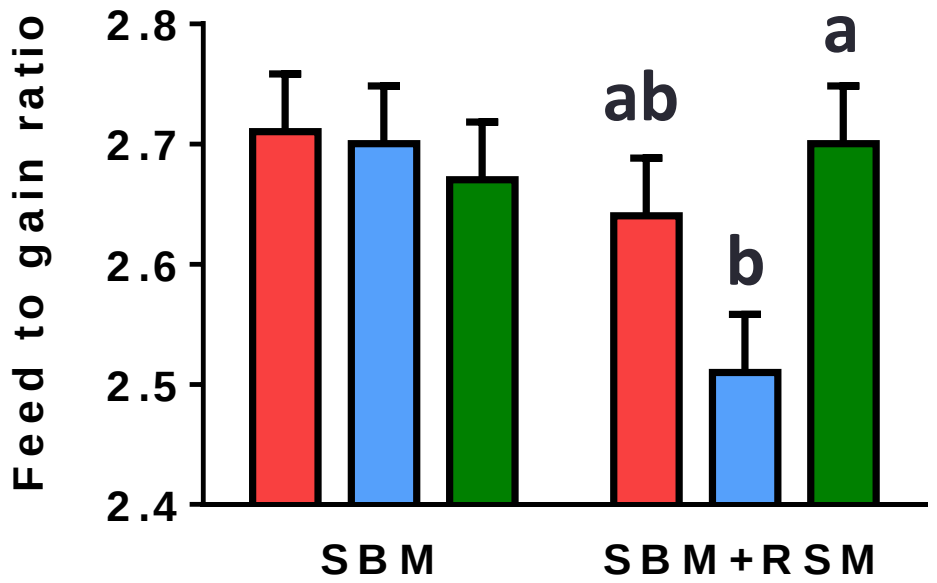
Trial 1 - ADFI (g/d) & F/G





a,b $P<0.05$

- ADFI with SBM+RSM was numerically increased with enzymes in a dose-dependent manner.
- Improved growth in SBM-RSM diet with 300 mg/kg of enzyme alongside improved F/G.

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Trial 2 - Diets

Ingredients, %	Grower-1		Grower-2		Finisher	
	Positive	Negative	Positive	Negative	Positive	Negative
Maize	61.41	63.03	50.00	50.00	40.00	40.00
Wheat	-	-	17.32	18.90	29.87	31.45
Soybean meal, 44% CP	24.00	24.00	18.62	18.62	16.39	16.39
Rapeseed meal	10.00	10.00	10.00	10.00	10.00	10.00
Lard	2.23	0.61	1.82	0.25	1.74	0.17
Dicalcium phosphate	1.12	1.11	0.92	0.90	0.84	0.83
Calcium carbonate	0.31	0.32	0.43	0.43	0.33	0.33
Salt	0.44	0.44	0.41	0.41	0.39	0.39
L-Lysine-HCl	0.08	0.07	0.07	0.06	0.03	0.03
Ethoxiquin	0.01	0.01	0.01	0.01	0.01	0.01
Minerals & vitamins*	0.40	0.40	0.40	0.40	0.40	0.40

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Trial 2 - Treatments

- **T-1:** Positive Control (SBM/RSM diet without enzyme)
- **T-2:** Positive control + Enzyme preparation (500 g/Tm)*
- **T-3:** Negative Control (SBM/RSM diet with 3% reduction of NE without enzyme)
- **T-4:** Negative Control + Enzyme preparation (500 g/kg)*

**Enzyme activity: 40,000 GalU/g; 50,000 AXC/g*

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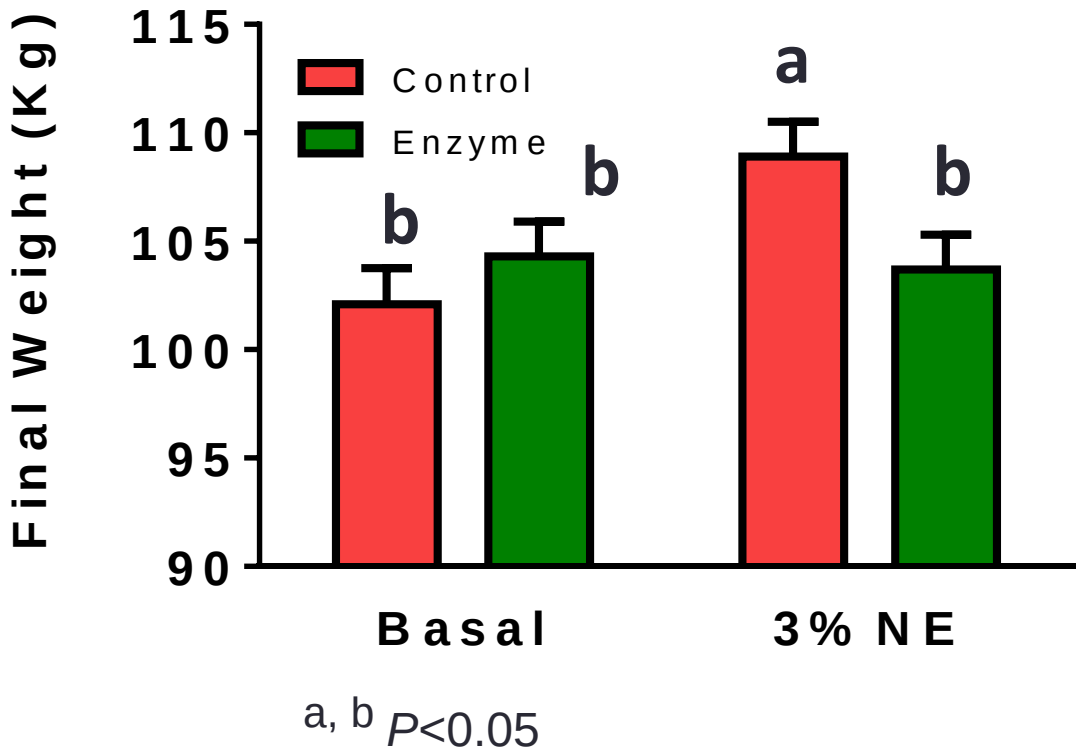
Trial 2 - Body weight (kg)



a, b $P<0.05$

	d0	*d28*	*d63*	*d98*
T-1 (PC)	25.3	44.4	70.1	102.1b
T-2 (PC + Enzy.)	25.3	43.9	70.9	104.3b
T-3 (NC; -3% NE)	25.3	44.4	72.2	108.9a
T-4 (NC + Enzy.)	25.3	43.7	70.3	103.7b
Root MSE	-	*2.36*	*4.22*	*6.83*
E (P<)	-	NS	NS	†
Enzy. (P<)	-	NS	NS	NS
E x Enzy. (P<)	-	NS	NS	*

NS P>0.1; † P<0.1; * P<0.05; ** P<0.01; *** P<0.001

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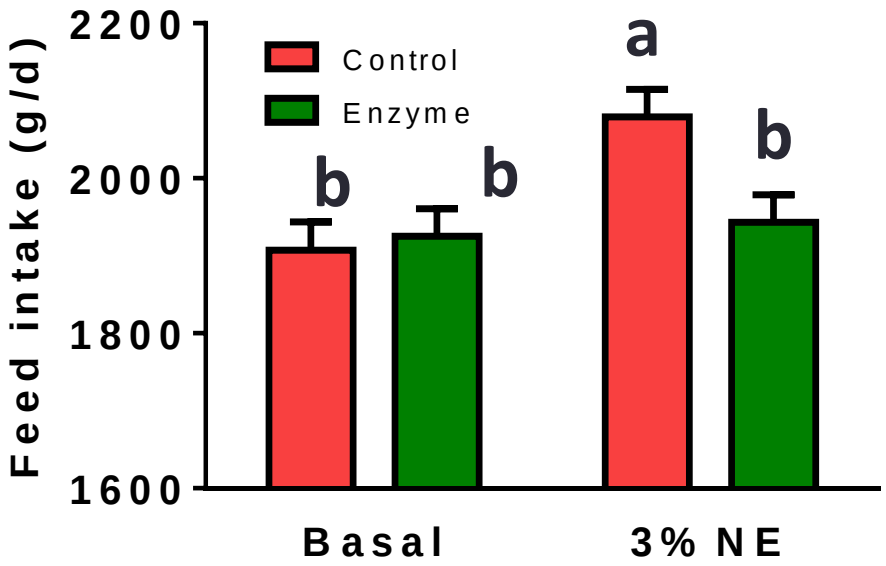
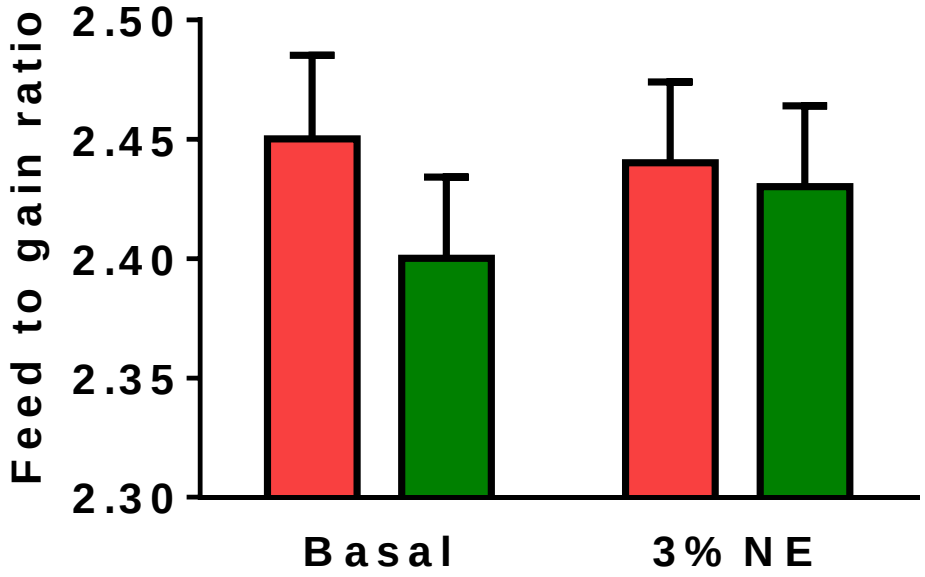
Trial 2 – ADFI (g/d) and F/G





- Feed intake similar to positive control when enzyme added to lower-energy diet.
- Enzymes numerically reduced F/G both added to basal and to energy restricted diets.

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Trial 2 - Carcass yield

	Carcass weight (kg)	Carcass yield (%)	Loin depth (mm)	Backfat thickness (mm)	Lean meat (%)
T-1 Positive Control	84.6	78.0	60.7	**14.4a**	**62.8a**
T-2 PC + Enzyme (500 g/Tm)	84.4	76.5	59.3	**16.0b**	**61.1b**
T-3 Negative Control (3% NE reduction)	88.9	77.8	59.4	**16.5b**	**60.7b**
T-4 NC + Enzyme (500 g/Tm)	85.2	77.1	61.0	**13.6a**	**63.5a**
Root MSE	*5.48*	*2.53*	*4.81*	*2.54*	*2.46*
Initial BW Effect (Pr>F)	**	NS	NS	†	†
Sex Effect (Pr>F)	NS	*	NS	NS	NS
Energy level Effect (Pr>F)	†	NS	NS	NS	NS
Enzyme Effect (Pr>F)	NS	†	NS	NS	NS
Energy x Enzyme Effect (Pr>F)	NS	NS	NS	***	***

NS P>0.1; † P<0.1; * P<0.05; ** P<0.01; *** P<0.001

- Enzymes added on top increased carcass fat deposition and lowered lean yield.
- Lower-energy diet without enzymes resulted in greater fat depositon than with enzymes.

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Conclusions

- A numerical increase of bodyweight and lower feed conversion of fattening pigs was observed when a combination of α-galactosidase and xylanase were added on top to Soybean-Rapeseed meal based diets.
- 3% NE restriction in the diet:
  - Compensated in treatment receiving enzyme.
  - In Negative Control, lower energy density might be counteracted by greater feed intake and protein deposition.
- Energy restriction was compensated by the enzymes and similar carcass performance was obtained.

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Conclusions

- In the NC treatment, higher fat deposition might be due to much higher feed intake to compensate for lower energy density of the diet.
- Adjusted dose of these enzymes to diets with legumes other than soybean meal and combined energy and protein restriction need to be explored.

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...THANKS FOR ATTENTION !

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