

Responses of growing-finishing pigs to two levels of a multi-enzyme blend (Natuzyne) as compared to pigs fed a lower energy-higher fiber, or a higher energy-lower fiber diet

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ABSTRACT

The objective of this study was to evaluate whether the performance of pigs could be maintained when pigs were fed a lower energy diet (ME = 3,423 kcal/kg) with higher fiber from 50% DDGS (NC), compared to a positive control (PC) diet with lower fiber and a maximum of 30% DDGS with an increased energy content from additional added fat (ME = 3,476 kcal/kg), when either 193 (NZ1X) or 386 (NZ2X) mg/kg of Natuzyne (a source of xylanase, phytase, cellulase, beta-glucanase, alpha-amylase and protease) was added to the NC diet. A FANCOM feed weighing system measured feed delivered to the individual pens, and weight of pigs (1024 pigs, initial body weight of 50.1 kg) and feed was determined on Day 0, 14, 28, 42, 56, 70 and 83. Blood glucose was measured at day 42 on trial. Data were analyzed as a completely randomized design using GLM in Minitab. On day 83 of the trial, NC (107.4 kg) and NZ2X (108.4 kg) weighed less ($P=0.050$) than PC (112.4 kg) and NZ1X was intermediate (109.5 kg). In Table 1 is a summary of performance. PC tended to have a 9.4% higher ADFI ($P=0.088$) than NC, with NZ1X 5.2% and NZ2X 4.3% intermediate. This difference in ADFI resulted in PC consuming 11.1% more energy per day (9,166 vs 8,249 kcal ME/d) than NC. The PC tended to have a 7.8% greater ADG than NC ($P=0.062$), with NZ1X and NZ2X intermediate. NZ1X and NZ2X tended to have lower mortality (including pulled pigs) than NC, with PC intermediate. No differences were observed in blood glucose ($P=0.294$), but NC had a 7.7% lower blood glucose (72.8 $\mu\text{mol/L}$) as compared to PC (78.8 $\mu\text{mol/L}$), NZ1X (78.8 $\mu\text{mol/L}$) and NZ2X (79.4 $\mu\text{mol/L}$). In conclusion, PC grew faster than NC and Natuzyne partially recovered the performance difference between NC and PC, and tended to improve survivability of pigs on a lower energy, high DDGS diet (NC).

BACKGROUND

- Feed cost is the largest proportion of the cost of production of swine, and utilization of higher levels of corn by-products may help reduce feed costs.
- Natuzyne contains multiple enzymes including phytase, xylanase, beta-glucanase and protease that has been shown in previous trials to improve ADG and FCR, when used in high fibre diets.

OBJECTIVES

The objective of this study was to evaluate whether the performance of pigs could be maintained when pigs were fed a negative control with lower energy and with higher fiber, compared to a positive control diet with lower fiber and an increased energy content, when either 193 or 386 mg/kg of Natuzyne was added to the negative control. Natuzyne also replaced the Phytase used.

MATERIALS & METHODS

- 1,024 commercial pigs (initial BW 50.1 kg)
- Blocked by environment and allocated by pen & weaning age
- Housed in a commercial wean to finish barn
- 83-d study
- 4 dietary treatments
- FANCOM feeding system
- Diets met or exceeded 2012 NRC requirements

Statistical Analysis

- CRD
- Minitab
 - GLM procedure
 - Tukey's test to determine differences
- Experimental Unit = pen
- Means reported as Adjusted Means

Performance

- Pens of pigs weighed on d 0, 14, 28, 42, 56, 70, & 83
- Feed disappearance measured
- ADG, ADFI, and FCR calculated
- Morbidity & mortality – pigs removed from pens & dead pigs
- Blood glucose – measured at d 42

DIETARY TREATMENTS

- NNC – negative control
 - low energy diet with high fiber (50% DDGS), 3,423 kcal/kg
- PC – positive control
 - high energy diet with low fiber (30% DDGS), 3,476 kcal/kg
- NZ1X – NC + 193 mg/kg of Natuzyne (Phytase removed)
- NZ2X – NC + 386 mg/kg of Natuzyne (Phytase removed)

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DIETS

Table 1. Composition of Phase 1 (27.2-45.4kg)

Ingredient	NC	PC	NZ1X	NZ2X
Corn	46.35	58.990	46.35	46.33
DDGS	35.00	17.50	35.00	35.00
Soybean Meal	14.50	18.00	14.50	14.50
Choice White Grease	1.50	2.75	1.50	1.50
Limestone	1.40	1.30	1.40	1.40
Monocalcium phosphate	-	0.25	-	-
Other ¹	1.25	1.30	1.23	1.23
Natuzyne	-	-	0.02	0.04
TOTAL	100.00	100.00	100.00	100.00

¹Other – salt, vitamin and trace mineral premix, L-lysine HCl, DL-methionine, L-threonine, L-tryptophan, and phytase.

Table 3. Composition of Phase 3 (72.6-90.7kg)

Ingredient	NC	PC	NZ1X	NZ2X
Corn	43.67	58.66	43.67	43.65
DDGS	50.00	30.00	50.00	50.00
Soybean Meal	2.75	6.50	2.75	2.75
Choice White Grease	1.25	2.50	1.25	1.25
Limestone	1.25	1.25	1.25	1.25
Other ¹	1.08	1.09	1.06	1.06
Natuzyne	-	-	0.02	0.04
TOTAL	100.00	100.00	100.00	100.00

¹Other – salt, vitamin and trace mineral premix, L-lysine HCl, DL-methionine, L-threonine, L-tryptophan, and phytase.

RESULTS

Table 4. Summary of Growth Performance

d 0-83	NC	PC	NZ1X	NZ2X	SE	P-value
BW, kg	107.4 ^c	112.4 ^d	109.5 ^{c,d}	108.4 ^c	3.22	0.050
ADG, g	821 ^c	885 ^d	848 ^{c,d}	835 ^{c,d}	41	0.062
ADFI, g	2,410 ^c	2,637 ^d	2,537 ^{c,d}	2,515 ^{c,d}	147	0.088
FCR, g/g	2.93	2.98	3.00	300	0.08	0.409
Morbidity/Mortality, %	4.52 ^c	1.38 ^{c,d}	0.81 ^d	0.98 ^d	2.41	0.051
d 42	NC	PC	NZ1X	NZ2X	SE	P-value
Blood glucose, µmol/L	72.8	78.8	78.8	79.4	5.59	0.294

^{c,d} Means with different superscripts in the same row differ at 0.10 < P > 0.05.

Table 2. Composition of Phase 2 (45.4-72.6kg)

Ingredient	NC	PC	NZ1X	NZ2X
Corn	38.25	57.46	38.25	38.23
DDGS	50.00	25.00	50.00	50.00
Soybean Meal	7.75	12.25	7.75	7.75
Choice White Grease	1.50	2.75	1.50	1.50
Limestone	1.35	1.35	1.35	1.35
Other ¹	1.15	1.19	1.13	1.13
Natuzyne	-	-	0.02	0.04
TOTAL	100.00	100.00	100.00	100.00

¹Other – salt, vitamin and trace mineral premix, L-lysine HCl, DL-methionine, L-threonine, L-tryptophan, and phytase.

Table 4. Composition of Phase 4 (90.7-108.8kg)

Ingredient	NC	PC	NZ1X	NZ2X
Corn	46.50	61.49	46.50	46.48
DDGS	50.00	30.00	50.00	50.00
Soybean Meal	-	3.75	-	-
Choice White Grease	1.25	2.50	1.25	1.25
Limestone	1.20	1.20	1.20	1.20
Other ¹	1.05	1.06	1.03	1.03
Natuzyne	-	-	0.02	0.04
TOTAL	100.00	100.00	100.00	100.00

¹Other – salt, vitamin and trace mineral premix, L-lysine HCl, DL-methionine, L-threonine, L-tryptophan, and phytase.

CONCLUSIONS

- The initial design intended a lower reduction in energy intake of 3% but due to a combination of reduced feed intake from higher fiber, and reduced energy content the PC consumed 11.1% more energy/d than the NC (9,166 vs 8,249 kcal ME/d)
- PC grew 7.3% faster than NC but NZ1X only grew 4.2% slower than PC, and Natuzyne supported greater feed intakes on the higher fiber NC ration
- NC had 7.7% lower blood glucose in contrast with PC, NZ1X, & NZ2X.
- PC grew faster than NC, and even with the larger than expected reduction in energy intake Natuzyne partially recovered the performance.
- Natuzyne tended to improve survivability of pigs on a lower energy, high DDGS diet, and the PC had higher survivability than NC