

Mitigation of phosphorus and nitrogen from pigs manure fed diets balanced according to ideal protein concept, supplemented with phytase

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Introduction The use of phytase enzyme in diets for pigs can contribute to the decrease use of nitrogen (N) and inorganic phosphorus (P) reducing the environmental impact caused by the excretion of these minerals. Phytase is an enzyme that catalyses the hydrolysis of orthophosphate groups from phytate molecules. Pigs lack this enzyme. Phosphorus losses from animal manures contribute to eutrophication in areas where animal feeding operations are geographically concentrated. Dietary modification with phytase is one strategy to reduce P inputs into animals, and thus P losses from manures. However, the full environmental impacts of dietary modification treatments are not fully understood. The aim of the experiment was to evaluate diets with phytase enzyme and based on the ideal protein for reducing the excretions of phosphorus and nitrogen.

Material and methods Twenty crossbred barrows (26.8 kg) were use in a randomized block design experiment, with five treatments and four replicates. The diets were formulated with corn, soybean meal, synthetic aminoacids and supplemented with quantum phytase of increasing levels, containing 14 % CP and 13.60 MJ DE/kg. The animals were kept in metabolic cages for a ten day adaptation period and seven days in total for collection of faeces and urine. Blood samples were taken for five days. On the first day of the collection period, each animal was injected intravenously with 7.4 MBq ³²P. At the end of the experimental period the animals were slaughtered and tissues of the muscle, heart, liver, kidneys and bones were collected for further studies.

Results There was a quadratic relationship of phytase levels with both P faeces and bioavailability. Figueirêdo *et al.* (2000) also observed a reduction in the P excretion in pigs fed diets supplemented with phytase enzyme. Urinary excretions showed a positive linear effect with phytase levels and P and N urinary. The use of phytase improved nutritional value of diets for nonruminant and also gave benefits to the environment, reducing P concentration in the faeces. It is necessary to create restrictive laws in Brazil for the use of manure in the soil, as well as rigorous control of P supplementation to avoid environmental pollution (Palhares, 2009).

Table 1 Effect of the phytase increasing levels about the P and N metabolism parameter in pigs fed with diets supplement phytase enzyme.

	Phytase enzyme (FTU/kg diet)					CV ^c
	0	250	500	750	1000	
Feed intake (g/ kgLW /d)	41.88	41.92	41.85	41.39	41.77	10.81
P intake (mg/ kgLW /d)	146.60	146.71	146.48	144.87	146.21	10.81
P faeces (mg/ kgLW /d) ^a	80.69	68.05	59.34	61.74	59.25	17.77
P endogenous (mg/ kgLW /d)	7.52	7.30	9.22	8.53	7.54	29.73
P urinary (%) ^b	0.17	0.22	1.55	5.63	5.78	58.07
Bioavailability (%) ^a	49.62	57.91	65.93	63.53	65.20	12.17
P retention (mg/ kgLW /d)	65.69	78.44	85.59	77.49	81.86	20.56
P plasma (mg/100ml)	8.31	8.10	8.66	8.54	8.83	5.58
N intake (mg/ kgLW/ d)	942.93	943.98	942.18	931.82	940.44	10.81
N faeces (%)	47.15	52.42	47.18	53.08	49.37	17.52
N Apparent absorption (%)	52.85	47.58	52.82	46.92	50.63	17.41
N urinary (%) ^b	12.08	15.37	18.78	16.82	17.80	27.38
N retention (%)	75.70	65.95	63.13	62.93	64.45	10.31

^a Quadratic effect (P<0.05), ^b Linear effect (P<0.08), ^c Coefficient of variation.

Conclusions The level of 500 FTU/kg of diet is indicated for diets for pigs based on soybean meal and corn, formulated in agreement with the concept of ideal protein.

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