

- the death rate of the leaves during the whole growing season
- translocation and conversion of constituents at the end of grain filling
- crop photosynthesis measurements
- more detailed simulation of the development stage
- testing and improvement of the model with experiments under different conditions.

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## The influence of the phosphorus concentration in the diet on the performance of fast-growing pigs

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**Abstract.** The effect of different P concentrations in cereal- and byproduct-based diets on performance was studied in growing pigs from 30 to 110 kg live weight. An

addition of 0.75 g inorganic phosphorus to diets with 1.6-1.8 g digestible P/kg dm was sufficient to achieve optimal results.

*Key-words:* phosphorus, pig, digestibility, feeding trials

**Introduction.** Recently there was a renewed interest in the phosphorus requirements of growing pigs. In the past years there were several changes in pig husbandry, which underlie this renewed interest: the increased growth rate and better feed conversion ratio of the pigs; a change in the feedstuff composition of mixed feeds for pigs; the high price of phosphate as a feedstuff; the aspect of environmental pollution by phosphorus and a possible relationship between a shortage of phosphorus in the diet and kg weakness.

**Material and methods.** In 6 feeding experiments with in total 359 pigs (modern, fast-growing boars and gilts; mostly crossbred) from 30 to 110 kg live weight the effect of the P concentration in the diet on the performance and leg score was investigated. In each experiment the different levels of phosphorus were realized by adding  $\text{CaHPO}_4$  to the diet in 3 or 4 steps of 0.75 g P per kg. All diets had a Ca/P ratio of  $\pm 1.3:1$ . There were, depending on the experiment, 10 to 22 animals per treatment.

In four experiments in some treatments the P concentration was changed in the course of the experiment.

In four experiments the pigs were fed ad libitum; in two of these experiments a byproduct-based diet was fed. In two other experiments the pigs were fed at a high level but restrictedly; in one a predominantly cereal-based and in the other a byproduct-based diet was used.

The diets were formulated to have a  $\text{NE}_f$  (net energy for fattening pigs, Dutch system) and lysine concentration of at least 9.05 MJ and 8.5 g per kg respectively. All diets were pelleted and the water supply was ad libitum. All animals were fed individually; they were also housed individually in 5 of the 6 experiments. The live weight and in most cases the feed intake were registered weekly or biweekly. The growth rate and feed conversion ratio from 30 to 110 kg were calculated by means of growth and feed intake curves, which were based on orthogonal polynomials. The digestibility of several components and of phosphorus was measured in the diets without supplementation of  $\text{CaHPO}_4$ . The results were analysed by analysis of variance.

**Results.** It appeared from the concomitant digestibility trials that the concentration of digestible P in the cereal- and byproduct-based diets without any P supplementation was almost the same: 1.6-1.8 g/kg dm. Thus concerning digestible phosphorus concentration both types of diets could be compared well with each other. According to the digestibility of crude protein, crude fat, crude fibre and nitrogen free extractives it was calculated that the mean  $\text{NE}_f$  concentration in the diets was 10.0 MJ/kg dm.

From 30 to 110 kg live weight the mean growth rate (of the pigs in all treatments over all experiments) was 850 g/day, the feed conversion ratio 25.39 MJ  $\text{NE}_f$ /kg live weight gain and the feed intake 2.47 kg/day. Within an experiment there were no

statistically significant differences as a result of the different P concentrations in the diet and no interactions between sex of the animal and the P concentration in the diet. However there was a tendency that animals in the treatment without any inorganic P supplementation had a somewhat lower feed intake and growth rate than animals which got diets to which 0.75 g inorganic P or more per kg was added. There was no effect of the P concentration in the diet on slaughter quality and on score of the legs.

**Discussion.** It is assumed that for the diet without any P supplementation the digestible P is equal to available P. Furthermore it is assumed that the availability of the added inorganic P is 90 %. Based on these assumptions and on the results of the feeding experiments, while taking into account (for safety reasons) the tendency towards lower feed intake on the diets without any P supplementation, a concentration of 2.2 g available P per kg diet with a  $NE_f$  concentration of 8.79 MJ for growing pigs from 30 kg live weight onwards is recommended. More research is needed regarding the availability of phosphorus of several separate feedstuffs for pigs.

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