

# Effects of dietary supplementation with a protease on the apparent ileal digestibility of the weaned piglet.

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## INTRODUCTION

Recently a novel serine protease expressed in *Bacillus licheniformis* was introduced into the market for broilers. Positive effects of proteases, generally used in enzyme cocktails, have been reported in different animal species. The development of an effective protease may not only reduce production costs for the farmer, by increasing the efficiency of feed utilization by the animals, but will also reduce the total content of nitrogen in manure and thereby meet the societal demand for a decreased nitrogen excretion. Therefore, and to extend the application of this novel protease to other species, the present work was to study the effects of this novel protease on the digestibility of vegetable proteins and energy, as well as on the growth performance of weanling pigs.

## MATERIALS AND METHODS

### Animals, Housing and Experimental Design

One hundred and twenty 28-day old weaner piglets (♀ Large-White x ♂ Redon) having an initial body weight of  $8.17 \pm 0.90$  kg were randomly allotted to 2 equal groups of 60 piglets each. They were housed in an environmentally controlled room in sub-groups of 12 pens of 5 animals.

### Diet, test compound and feeding

The diet used was formulated to meet the animals' requirements according to NRC (1998). Animals were fed for 29 days corn-soybean meal based diet (Std) or this diet with addition of a granulated serine protease RONOZYME® ProAct (CT) at the levels of 15 000 PROT/kg (Prot). All the diets were distributed *ad libitum* in a mash form. An indigestible marker, chromium oxide (Cr), was added at a concentration of 0.4% to all the diets in order to measure the apparent ileal digestibility (AID).

### Data recording and sample collection

For AID determinations, the distal ileal digesta (2 to 3 m before the caecum) was sampled after euthanasia in 35 pigs from each group at day 14 and in 25 pigs from each group at day 29. After sampling, the collected digesta were weighed, frozen at  $-80^{\circ}\text{C}$ , freeze dried and grounded into a fine powder.

### Chemical analysis

All samples of diets and ileal digesta were analyzed in duplicate for DM (method 930.15; AOAC Int., 2007), and triplicate for Cr (method 990.08; AOAC Int., 2007), total nitrogen (method 990.03; AOAC Int., 2007), total energy by using a calorimeter and AA [method 982.30 E (a, b); AOAC Int., 2007].

### Calculations and statistical analysis

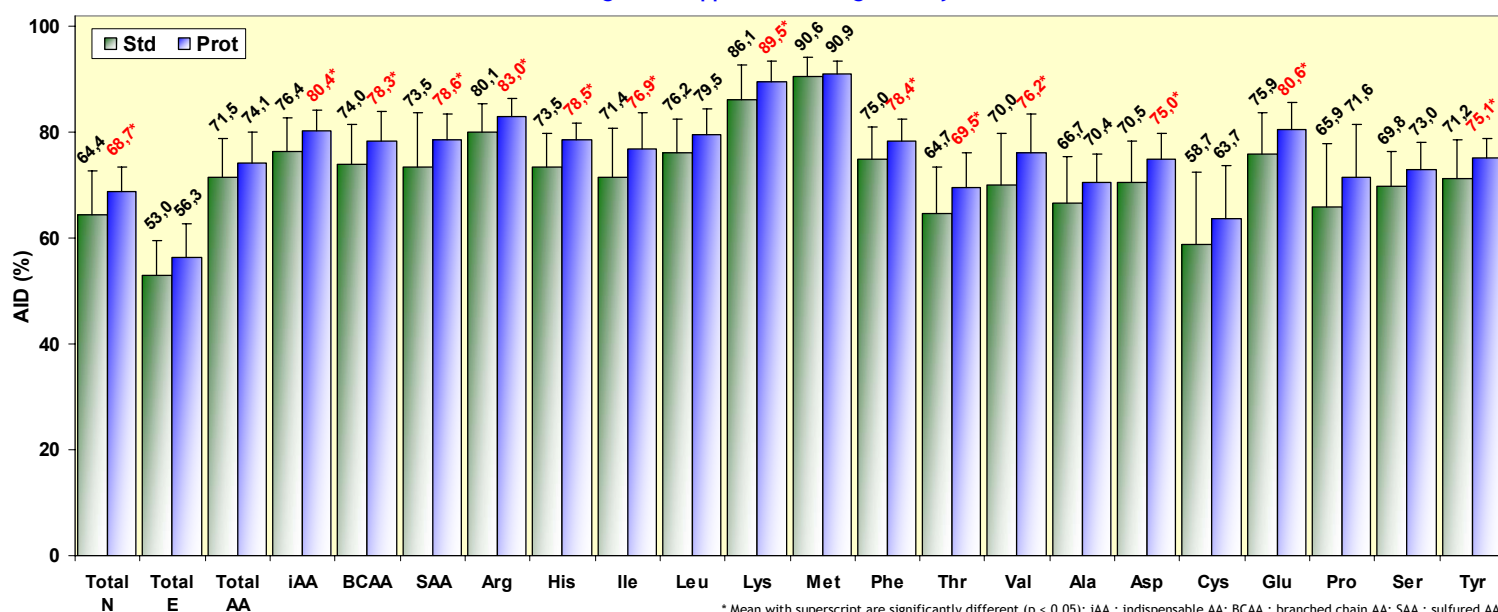
Statistical analyses were performed using the StatGraphics Centurion XVI statistical software package. All data were examined by analysis of variance (ANOVA) and Student t test. Pig was the experimental unit. Pig and diet were used as class variables. In all instances, differences were reported as significant at  $P < 0.05$ .

## RESULTS AND DISCUSSION

The analyzed protease activity in the supplemented diet was in excellent agreement with the planned inclusion level whereas it was under the detection limit in the Std diet. All piglets stayed healthy throughout the experiment and readily consumed their diets.

The protease did not improve the AID during the first period of the experiment. At the end of the study (figure 1) in the protease supplemented animals, the AID of the indispensable AA, Arg (83.0%), His (78.5%), Ile (76.9%), Lys (89.5%), Phe (78.4%), Thr (69.5%) and Val (76.2%) was increased ( $P < 0.05$ ) by 3.7, 6.8, 7.8, 4.0, 4.5, 7.4, and 8.8%, respectively. In the same piglet group, the AID of the dispensable AA, Asp (75.0%), Glu(80.6%) and Tyr (75.1%) was increased ( $P < 0.05$ ) by 6.4, 6.3 and 5.4, respectively. As result of, the AID of the total indispensable AA (80.4%), branched chain AA (78.3%), sulfured AA (78.6%) and total N (68.7%) was also improved ( $P < 0.05$ ) by 5.3, 6.9 and 5.8%, respectively. The AID of the sum of the individual AA was not modified comparatively to the Std group. However, in the Prot group, the observed positive effects on the AID of AA had only a moderate effect on the AID of total E, although most of the concerned AA are glucogenic. Single exogenous protease application in swine is relatively new and as for poultry some controversial effects on digestibility and performance have been reported (Caine *et al.*, 1997; O'Doherty and Forde, 1999; Wang *et al.*, 2011). The lack of effect of the protease observed during the first period corresponded to the post-weaning phase where the exocrine pancreas enzyme secretions are in an exponential phase (Rantzer *et al.*, 1997) and could cover the protease activity. On the other hand, in the second period where the pancreatic enzyme secretions have reached a standardized level, the exogenous protease has room to improve the feed protein utilization. The results presented in this study only provide a first estimate of the potential benefits of using a protease as single feed enzyme for piglet production and illustrate by the improved protein digestibility that its use can, by that, contribute to reduce nitrogen emissions from livestock production.

Figure 1 : Apparent ileal digestibility



\* Mean with superscript are significantly different ( $p < 0.05$ ); iAA : indispensable AA; BCAA : branched chain AA; SAA : sulfured AA

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