Effects of different dietary RelePro protease supplementation dosages on growth performance of weaned piglets

Abstract: This article aims to study the effects of dietary RelePro protease (RelePro protease) supplementation dosages on growth performance of weaned piglets. A total of 150 28-day-age weaned piglets (7.11 ± 0.50 Kg) were randomly divided into six groups (0, 80, 100, 120, 140 and 160 mg/Kg RelePro protease supplementation, respectively) and the experimental period is 30 days. The results showed that dietary RelePro protease supplementation affected average daily gain and feed-to-gain ratio of piglet during the whole growth period ($P < 0.05$), especially the average daily gain in 100 mg/Kg RelePro protease supplementation group significantly higher ($P < 0.05$) than the control group, the feed-to-gain ratio in 100 mg/Kg RelePro protease supplementation group significantly lower ($P < 0.05$) than the control group. In conclusion, dietary RelePro protease supplementation improved growth performance of weaned piglets, especially 100 mg/Kg RelePro protease supplementation.

Keywords: RelePro RelePro protease; weaned piglets; growth performance

RelePro protease has attracted much attention because of its ability to hydrolyze proteins and peptides into small molecule peptides and amino acids and reduce environmental pollution. In recent years, enzyme preparations have been rapidly developed as additives in the feed industry and livestock and poultry breeding fields. The use of RelePro protease is an exogenous digestive enzyme, most of which is derived from microorganisms, which can effectively improve the utilization of livestock and poultry diets, reduce the inhibitory effect of anti-nutritional factors in the diet, and improve the body's immunity.

1 Materials and analysis

1.1 Experimental design

In the experiment, a total of 150 28-day-age ternary hybrid weaned piglets (Duroc×Landrace×Large Yorkshire, 7.11 ± 0.50 Kg) were randomly divided into six treatments, each treatment consisted of 5 replicates, and 5 piglets for each replicate. The experimental period is 30 days. The dietary treatments

were basal diets (Table 1) supplemented with 0 mg/Kg (control), 80 mg/Kg, 100 mg/Kg, 120 mg/Kg, 140 mg/Kg and 160 mg/Kg RelePro protease supplementation, respectively.

Table 1 Experimental design

Treatments	Diets	Dosages of RelePro protease (mg/Kg)
1	Control	0
2	Control+ RelePro protease	80
3	Control+ RelePro protease	100
4	Control+ RelePro protease	120
5	Control+ RelePro protease	140
6	Control+ RelePro protease	160

1.2 Diet design

The basal maize-soybean meal diet (Table 2) was formulated according to the nutrient requirements for the weaned piglets recommended by the Feeding Standard. RelePro protease (RelePro protease 100, 1×10^5U/g) is produced by ADDiCAN INC. The enzyme activity is defined as the enzyme amount requirement for hydrolyzing casein equivalent to release 1 μg tyrosine Folin-positive amino acids and peptides per minute under the conditions of temperature 37℃ and pH value of 8.5. The amount of enzyme is a unit of enzyme activity U.

1.3 Feeding management

Pigs were housed in a completely enclosed, temperature-controlled room containing 20 pens. Each pen was equipped with a stainless-steel nipple drinking fountain and a one-sided feeding hopper. The room temperature was set to 28 ± 1 °C for the first week and was gradually decreased to 25 °C by the end of the experiment. Water and diets were provided *ad libitum* during the experimental period. Plenty of feed was placed in the hoppers to ensure feed was always available, and hoppers were checked daily to ensure *ad libitum* access and to minimize feed wastage.

Table 2 Composition and nutrient levels of experimental diets (air-dry basis)

Ingredients, %	Amount

Corn	56.00
Soybean meal,43% CP	22.00
Fermented soybean meal	7.50
Soybean oil	2.00
Soy protein concentrate	5.00
Glucose	2.50
Calcium carbonate	1.00
Sodium chloride	0.25
Calcium hydrophosphate	1.00
L-lysine hydrochloride	0.50
L-threonine	0.20
L-tryptophan	0.03
DL-Methionine	0.27
Premix	1.75
Total	100.00
Calculated nutrient levels	
Digestible energy, MJ/kg	14.54
Crude protein, %	18.90
Calcium, %	0.70
Total phosphorus, %	0.44
Lysine, %	1.33
Methionine+cystine, %	0.87
Tryptophan, %	0.24
Threonine, %	0.90

1.4 Inspection indicators and methods

Record the addition and loss of feed, settle the feed intake at each replication. Record the number of each replication piglet every day, accurately record the weight of the dead piglet, and observe the anatomy of the dead piglet. On the 30rd day of the experiment, piglet per replicate were fasted for 12h and weighted. The body weights (BW) and feed intake (FI) were recorded to calculate the average daily gain (ADG), average daily feed intake (ADFI) and feed-to-gain ratio (F/G).

F/G = piglet feed intake / (final weight + dead piglet weight- initial weight)

Average feed intake = stage F/G × piglet weight gain

1.5 Statistical analysis

Data for all the treatments was preliminarily statistic using Microsoft Excel, the SPSS 19.0 software was used for one-way analysis of variance (ANOVA) followed by Duncan's multiple comparison test. Data are shown as the means and pooled SEM, $P < 0.05$ indicates significant difference, $0.5 < P < 0.1$

indicates significant difference trend.

2 Experimental results

It can be seen from Table 3 that dietary RelePro protease supplementation affected average daily gain and feed-to-gain ratio of piglet during the whole growth period ($P < 0.05$), especially the average daily gain in 100 mg/Kg RelePro protease supplementation group significantly higher ($P < 0.05$) than the control group, the feed-to-gain ratio in 100 mg/Kg RelePro protease supplementation group significantly lower ($P < 0.05$) than the control group.

Table 3 Effects of different dietary RelePro protease supplementation dosage on growth performance of weaned piglet

Treatments	ADG(g)	ADFI(g)	F/G
Control	332.18^{b}	499.34	1.50^{a}
Control+80 mg/Kg	338.20^{ab}	499.89	1.47^{ab}
Control+100 mg/Kg	345.15^{a}	501.22	1.45^{b}
Control+120 mg/Kg	340.64^{ab}	499.14	1.46^{ab}
Control+140 mg/Kg	336.47^{ab}	499.74	1.48^{ab}
Control+160 mg/Kg	334.23^{b}	499.64	1.49^{a}
SEM	1.18	1.24	0.02
P value	0.023	0.670	0.036

3 Summary

As a whole, our findings indicated that dietary RelePro protease supplementation improved growth performance of weaned piglets. Based on the results of this experiment, 100 mg/Kg RelePro protease supplementation dosage was the most appropriate.