

Xylanase impact beyond performance: effects on gut structure, faecal volatile fatty acid content and ammonia emissions in weaned piglets

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Introduction

Exogenous carbohydrases are commonly added to monogastric animal feed to degrade non-starch polysaccharides (NSP) for improving zootechnical performance and nutrient digestibility. The present study aimed to assess the impact of a new, intrinsically thermostable, β -1-4, endo-xylanase (Xygest™ HT by Kemin Europa), produced by *Pichia pastoris*, on growth performance, nutrient digestibility, and gut function in weaned piglets.

Methods



144 weaned piglets

9 replicates per treatment

Corn/wheat-based diets

Duration 35 days

T1: Control, no xylanase
T2: 45,000 U/kg feed (15 g/t)
T3: 90,000 U/kg feed (30 g/t)
T4: 135,000 U/kg feed (45 g/t)

Feed conversion rate (FCR), incidence of diarrhea, gut morphology, nutrient digestibility, volatile fatty acid production and ammonia emission were monitored.

Statistical analyses were carried out using ANOVA and Tukey's test using JMP® 15.0.

Results

Fig 1. Effects of xylanase enzyme supplementation on FCR

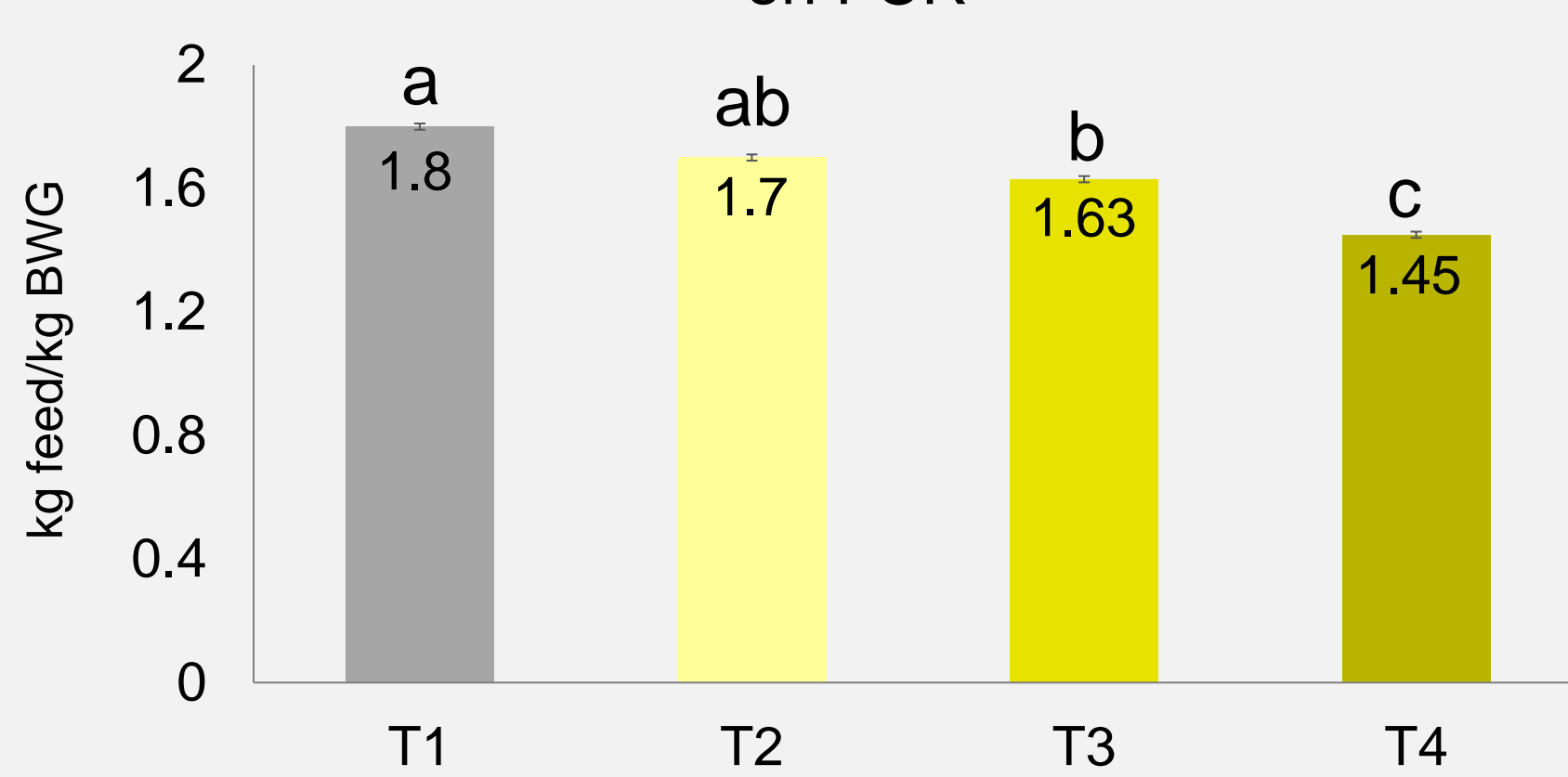


Fig 2. Effects of xylanase enzyme supplementation on incidence of diarrhea

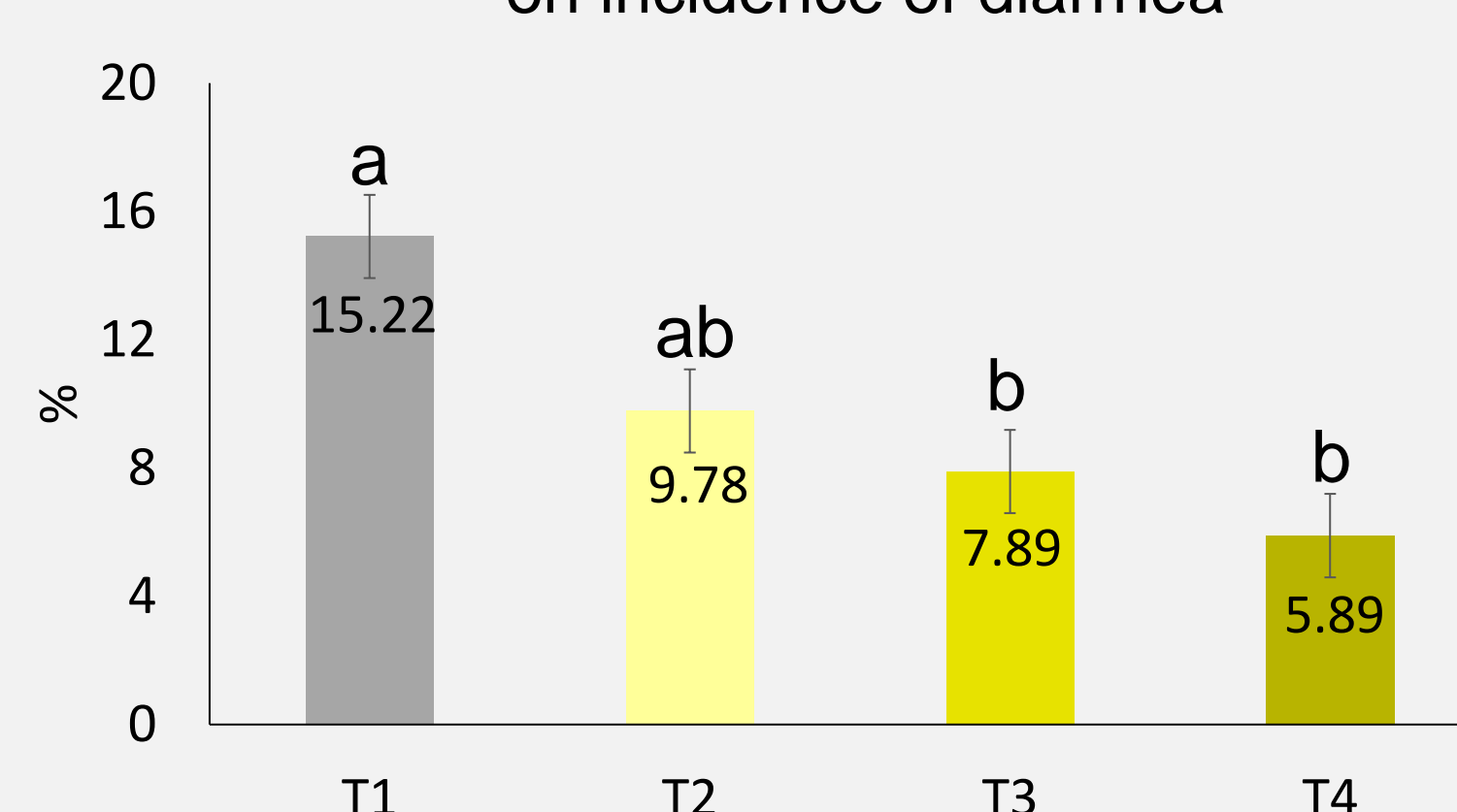


Fig 3. Effects of xylanase enzyme supplementation on jejunal villus height

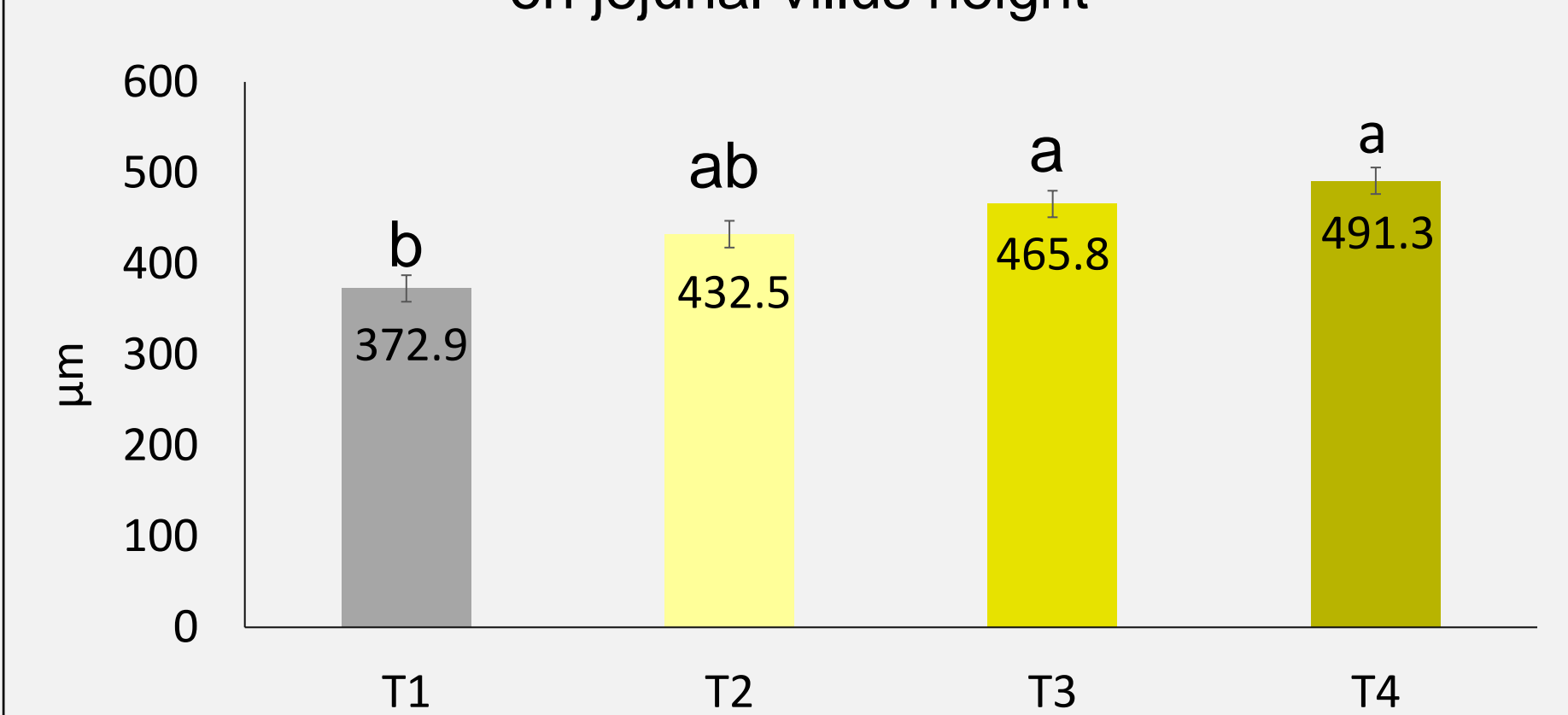


Fig 4. Effects of xylanase enzyme supplementation on propionate concentration in faeces

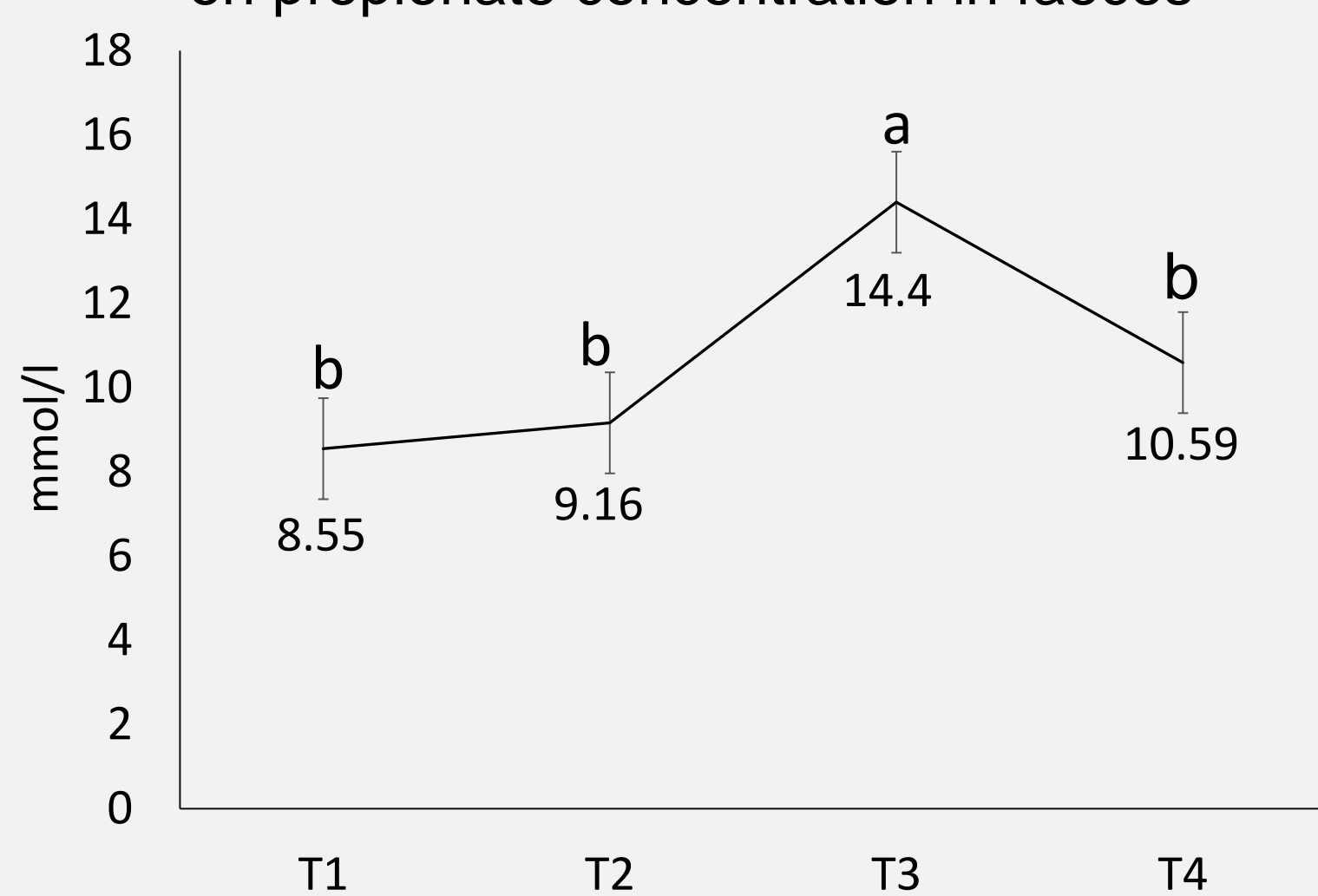


Fig 5. Effects of xylanase enzyme supplementation on faecal ammonia emissions

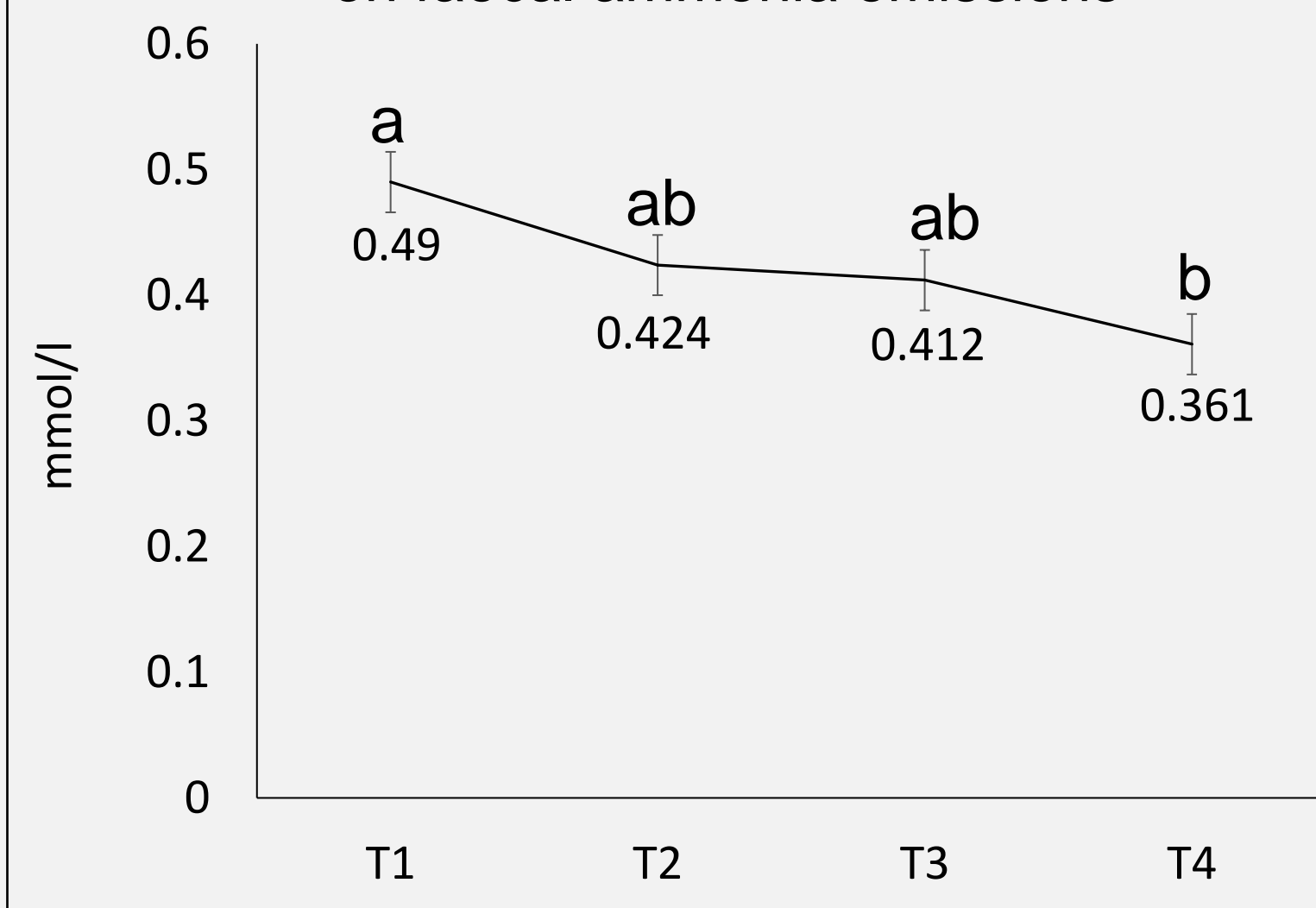


Table 1. Effects of xylanase enzyme supplementation on ileal digestibility

Criteria	Control	T1	T2	T3	SEM
Nutrient digestibility (%)					
Dry matter	91.49 ^c	93.61 ^b	93.37 ^b	95.19 ^a	0.218
Crude protein	87.29 ^c	90.68 ^b	90.61 ^b	93.33 ^a	0.468
Crude fat	82.60 ^b	88.90 ^a	87.24 ^a	89.45 ^a	1.037
Crude fiber	67.11	70.94	72.22	74.26	1.478
Neutral detergent fiber	66.15	66.85	67.21	67.49	0.343
Acid detergent fiber	65.90 ^c	67.49 ^{bc}	70.36 ^{ab}	70.81 ^{ab}	1.034
Energy	54.96 ^b	68.40 ^a	74.11 ^a	78.76 ^a	3.880
Starch	51.34 ^c	62.51 ^b	64.82 ^{ab}	70.74 ^a	1.950

^{a, b} Means within the same row with different superscripts are significantly different at $p < 0.05$.

- Xylanase supplementation at 90,000 U/kg significantly reduced feed conversion compared to non xylanase fed pigs ($p < 0.001$).
- Inclusion of 90,000 U/kg also significantly reduced the incidence of diarrhea ($p = 0.0021$) and increased villi length in the jejunum ($p = 0.0001$).
- Propionic acid production (at 90,000 U/kg; $p = 0.0011$) and ammonia emission (at 135,000 U/kg; $p = 0.0001$) were also beneficially affected.
- Irrespective of the inclusion rate, xylanase supplementation drastically improved nutrient digestibility ($p < 0.05$).

Discussion

- Feeding pigs a corn/wheat-based diet, supplemented with a new xylanase at 90,000 U/kg significantly improves feed efficiency, reflected by a higher nutrient digestibility and reduced FCR.
- The concentration of volatile fatty acids in the faeces, positively correlated with fiber digestion, significantly increased in pigs supplemented with 90,000 U/kg xylanase.
- The new xylanase induces positive effects in the intestinal tract, suggesting it could be a valuable nutritional tool to mitigate gut health disorders and thus support pig production performance.
- Additionally, xylanase supplementation improved the environmental footprint of production as seen in lower ammonia emissions.
- Further evaluation of the effect of the tested xylanase in high-NSP diets can provide more insight into its potential added value in pig production.