An Enzyme Blend Improved Growth Performance in Nursery Pigs

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Summary and Implications

The objective of this experiment was to evaluate the effects of dietary xylanase and an enzyme blend (EB: cellulase, ß-glucanase, and xylanase) on nutrient digestibility and growth performance in weaned piglets fed a low energy diet. A total of 460 pigs weighing about 6.43 kg were randomly blocked by weight and assigned to 4 treatments, in a 2 × 2 factorial arrangement. There were 12 blocks and 48 pens with 9 or 10 pigs/pen. The diets were based on corn, soybean meal, corn DDGS, and wheat middlings (5 and 10% each fiber ingredient for wk 1-2 and 3-4, respectively) with or without enzyme supplementation (Huvepharma Inc., St. Louis, MO), with 0.40% titanium dioxide as an indigestible marker. Body weight and feed intake were recorded weekly. Performance data were analyzed as repeated measurements using the PROC MIXED procedure of SAS (9.4) with pen as the experimental unit. Xylanase (0 or 0.01%), EB (0 or 0.01%), and their interactions were considered fixed effects. The EB addition (12.45 vs. 12.08 kg; $P = 0.044$), but not xylanase (12.27 vs. 12.26 kg; $P > 0.05$), increased body weight. Neither enzyme treatment had an impact on ADFI or G:F ratio ($P > 0.05$). The EB treatment improved ADG (482 vs. 466 g; $P = 0.024$) from wk 1-4. There was no enzyme impact on ATTD of DM, GE, and CP ($P > 0.05$). Xylanase supplementation tended to reduce ATTD of EE (61.05 vs. 62.82%; $P = 0.073$) and reduced the ATTD of NDF (46.10 vs. 48.95%), ADF (27.30 vs. 31.71%), and hemicellulose (52.77 vs. 55.23%; $P < 0.01$). Supplementation of EB improved ATTD of ADF by 22% (32.45 vs. 26.57%; $P = 0.001$). In conclusion, EB but not xylanase improved growth rate in nursery pigs fed a low energy diet, which may not be completely due to the improvement in ADF digestibility.

Introduction

With the expansion of the biofuel industry, the availability of co-products for use in pig diets has increased to reduce feed cost, especially when the price of corn and soybean meal increases. However, most grain co-products in the U.S. contain high levels of insoluble fiber. Exogenous carbohydrases can degrade the indigestible components in swine diet, thus may increase nutrient digestibility and improve growth performance. The experimental objective was to investigate the effects of dietary xylanase and an enzyme blend (EB: cellulase, ß-glucanase, and xylanase) on nutrient digestibility and growth performance in weaned piglets fed a low energy diet (NE: 2.43 and 2.37 Mcal/kg for wk 1-2 and 3-4, respectively).

Materials and Methods

A total of 460 pigs (6.43 ± 0.06 kg BW; F52 Gentaporc × 6.0 Gentaporc) were randomly blocked by weight and assigned to 4 treatments, in a 2 × 2 factorial arrangement. There were 12 blocks and 48 pens with 9 or 10 pigs/pen. The diets were based on corn, soybean meal, corn DDGS, and wheat middlings (5 and 10% each fiber ingredient for wk 1-2 and 3-4, respectively) with or without enzyme supplementation (Huvepharma Inc., St. Louis, MO), with 0.40% titanium dioxide as an indigestible marker. Body weight and feed intake were recorded weekly. Fecal samples were collected on d 24-26 and homogenized to analyze nutrient concentration. Data were analyzed as repeated measurements using the PROC MIXED procedure of SAS (9.4) with pen as the experimental unit. Xylanase (0 or 0.01%), EB (0 or 0.01%), and their interaction were considered fixed effects, and blocks were random effects.

Results and Discussion

The EB addition (12.45 vs. 12.08 kg; $P = 0.044$), but not xylanase (12.27 vs. 12.26 kg; $P > 0.05$), increased body weight (Table 1). Neither enzyme treatment had an impact on ADFI or G:F ratio ($P > 0.05$). The EB treatment improved ADG (482 vs. 466 g; $P = 0.024$) from wk 1-4. There was no enzymes effect on ATTD of DM, GE, and CP ($P > 0.05$). Xylanase supplementation tended to reduce ATTD of EE (61.05 vs. 62.82%; $P = 0.073$) and reduced the ATTD of NDF (46.10 vs. 48.95%), ADF (27.30 vs. 31.71%), and hemicellulose (52.77 vs. 55.23%; $P < 0.01$). Supplementation of EB improved ATTD of ADF by 22% (32.45 vs. 26.57%; $P = 0.001$). In summary, EB but not xylanase improved growth rate of nursery pigs fed a low energy diet. The improvement in growth by adding the EB may not be completely explained by increased ADF digestibility.

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Table 1. Effects of xylanase and an enzyme blend on growth performance and apparent total tract nutrient digestibility in nursery pigs

Item	Xylanase		Enzyme Blend[1]		SEM	*P* value		
	-	+	-	+		Xylanase	Enzyme Blend[1]	Xylanase*EB[2]
Average BW, kg	12.26	12.27	12.08	12.45	0.44	0.961	0.044	0.327
ADG, g	0.470	0.478	0.466	0.482	0.01	0.251	0.024	0.910
ADFI, g	0.652	0.667	0.655	0.664	0.02	0.419	0.639	0.738
G:F	0.75	0.76	0.75	0.76	0.13	0.345	0.219	0.672
DM, %	83.79	83.59	83.45	83.93	0.28	0.600	0.225	0.966
GE, %	82.30	82.11	82.04	82.37	0.33	0.700	0.488	0.965
CP, %	83.66	83.94	83.21	84.39	0.56	0.726	0.151	0.705
EE, %	62.82	61.05	61.78	62.10	0.68	0.073	0.737	0.285
NDF, %	48.95	46.10	47.11	47.94	0.65	0.004	0.375	0.535
ADF, %	31.71	27.30	26.57	32.45	1.09	0.008	0.001	0.824
Hemicellulose, %	55.23	52.77	54.26	53.74	0.53	0.003	0.494	0.273

1 One gram enzyme blend contains 7000 CU cellulose, 5000 U beta-glucanase, and 1000 EPU xylanase

[2] Interaction effects of xylanase and an enzyme blend