

141 Evaluation of a Fermented Corn Protein Source on Growth Performance of Nursery Pigs.

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Abstract: Two experiments were conducted to determine if fermented corn protein (FCP) can serve as a replacement to enzymatically treated soybean meal (ESBM) in 6.0 to 15.8 kg or as a replacement for soybean meal in 12.1 to 24.7 kg pig nursery diets. In Exp. 1, 350 barrows (initially 6.0 kg) were randomly allotted to 5 treatments with 5 pigs/pen and 14 replications/treatment. Dietary treatments were arranged in a 2×2 + 1 factorial with a control diet or diets with 5 or 10% FCP or ESBM. Newly weaned pigs were fed phase 1 diets for 10-d followed by phase 2 diets for 21-d. There were no interactions throughout the experiment. Overall (d 0-31), pigs fed increasing FCP had decreased (linear, $P \leq 0.026$) ADG and ADFI with no differences in G:F, whereas increasing ESBM had no effect on growth performance (Table). Pigs fed ESBM had increased ($P \leq 0.034$) ADG and G:F compared with pigs fed FCP with no effect on ADFI. In Exp 2, 350 pigs (initially 12.1 kg) were randomly assigned to pens with 5 pigs/pen and 14 replications/treatment. On d 24 after weaning (d 0 of trial), pens of pigs were weighed and assigned to 5 dietary treatments. Dietary treatments were arranged in a 2×2 + 1 factorial with a control diet or diets with 10 or 20% FCP with either high or low Val+Ile:Leu ratios. There were no interactions observed throughout the experiment. Overall (d 0-21), ADG, ADFI, and G:F worsened (linear, $P < 0.001$) as FCP increased. High Val+Ile:Leu ratios improved ($P = 0.017$) G:F compared with low Val+Ile:Leu ratios with no effect on ADG and ADFI. In summary, using FCP to replace ESBM for nursery pigs weighing 6.0 to 15.8 kg had decreased growth performance. Increasing concentrations of FCP in diets for pigs weighting 12.1 to 24.7 kg worsened growth and increasing Val+Ile:Leu ratios only improved G:F.

Table 1. Interactive effect of protein source and inclusion level on nursery pig performance, Exp. 1

Item	Control	Fermented corn protein		Enzymatically treated soybean meal		SEM	$P^{1,2}$ Protein source ²
		5%	10%	5%	10%		
Overall (d 0-31)							
ADG, g ³	331	300	299	319	318	9.3	0.034
ADFI, g ³	419	381	386	398	398	10.6	0.161
G:F, g/kg	790	785	776	801	799	8.0	0.010

¹ There were no quadratic responses observed ($P > 0.05$) for increasing fermented corn protein, no linear or quadratic responses observed ($P > 0.05$) for increasing enzymatically treated soybean meal, and no protein source × inclusion level interactions observed ($P > 0.05$).

² Comparison of fermented corn protein and enzymatically treated soybean meal excluding the control.

³ Pigs fed increasing fermented corn protein had decreased (linear, $P < 0.026$) ADG and ADFI.

Keywords: fermented corn protein, enzymatically treated soybean meal, branch chain amino acids

137 Inclusion of Spray Dried Plasma in Diets Based on Different Ingredient Combinations Increases the Digestibility of Energy, Fiber, Ca, and P by Young Pigs.

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Abstract: An experiment was conducted to test the hypothesis that spray dried plasma (SDP) increases the apparent total tract digestibility (ATTD) of gross energy (GE), nitrogen (N), total dietary fiber (TDF), Ca, and P and the standardized total tract digestibility (STTD) of P from other ingredients in diets for young pigs. Eighty barrows (body weight: 9.30 ± 0.97 kg) housed in metabolism crates were allotted to a randomized complete block design with 10 diets and 2 blocks. Diets typically used in 4 regions using combinations of corn, soybean meal, wheat, barley, or rice were formulated: U.S.A., European Union, Canada, and Asia, and included 0 or 6% SDP. Differences between measured and predicted values for ATTD and STTD of energy and nutrients in diets with SDP were calculated. Data were analyzed using PROC MIXED of SAS as a 2 × 4 factorial with 2 SDP levels and 4 regions. When 6% SDP was included in the diet, ATTD and STTD values, except TDF, were increased ($P < 0.05$) compared with diets without SDP (Table 1). The ATTD of GE, TDF, and P and the STTD of P was greater ($P < 0.05$) for the Asia diet compared with the other diets. The measured ATTD of TDF was greater ($P < 0.05$) than the predicted for the U.S.A. and European Union diets (Table 2), and the measured ATTD of GE, N, Ca, and P and STTD of P was greater ($P < 0.05$) than the predicted for the Asia diet compared with the other diets. In conclusion, addition of 6% SDP to a diet increases the ATTD of energy and nutrients and the STTD of P regardless of diet composition, and therefore, the actual ATTD of energy and nutrients and the STTD of P in diets with SDP may be greater than predicted.

Table 1. Apparent total tract digestibility (ATTD) of gross energy (GE), nitrogen (N), total dietary fiber (TDF), Ca, and P, and standardized total tract digestibility (STTD) of P in regional diets without or with spray dried plasma (SDP)¹

Diet	ATTD, %					STTD ² , %
	GE	Nitrogen	TDF	Ca	P	P
U.S.A.	86.8	83.1	63.9	71.6	68	71
U.S.A. + SDP	87.6	85.8	66.2	70.9	71.9	74.5
European Union	86.2	82.3	63.4	70	67.2	70.2
European Union + SDP	87.5	85.5	67.7	72.5	72.4	75.2
Canada	84.9	80.7	63.1	70.9	67.7	70.6
Canada + SDP	87.2	85.1	62.1	74.5	71.8	74.7
Asia	91.4	83.8	71.7	68.2	72	75.1
Asia + SDP	92.9	88.3	72.6	75.3	78.2	81
Pooled SEM	0.67	0.81	1.35	2.1	1.6	1.6
P-value (SDP)	<0.001	<0.001	0.085	0.041	<0.001	<0.001
P-value (Region)	<0.001	0.003	<0.001	0.894	<0.001	<0.001
P-value (SDP × Region)	0.568	0.578	0.214	0.303	0.832	0.848

¹Data are least squares means of 8 observations for U.S.A., the European Union, Asia, and Asia + SDP diets; 7 observations for the European Union, Canada, and Canada + SDP diets; and 6 observations for the U.S.A. + SDP diet.

²The STTD of P in diets was calculated by correcting ATTD of P for basal endogenous P loss (193 mg/kg dry matter intake) that was obtained from pigs fed the P-free diet.

Table 2. Differences¹ between measured and predicted apparent total tract digestibility (ATTD) values for gross energy, nitrogen, Ca, P, and total dietary fiber (TDF) and for standardized total tract digestibility (STTD) of P in regional diets with spray dried plasma from the U.S.A., European Union, Canada, and Asia^{2,3}

Item	U.S.A.	European Union	Canada	Asia	Overall ⁴
ATTD, %					
Gross energy	0.14	0.71	1.65*	1.29*	3.36*
Nitrogen	0.12	0.47	1.29	2.20*	2.36*
Ca	-0.83	2.45	3.56*	6.95*	3.10*
P	0.44	1.79	0.92	3.31*	2.77*
TDF	2.76*	4.89*	-0.52	2.41	3.48*
STTD, %					
P	-0.26	1.03	0.41	2.62*	1.64

¹Difference is calculated by subtracting predicted ATTD of gross energy, nitrogen, IDF, SDF, TDF, Ca, or P from measured value. Likewise, for the difference between predicted value for STTD of P from measured value.

²Data are least square means of 6 to 8 observations, except for the calculation of overall which are least square means of 30 to 32 observations.

³* = $P \leq 0.05$.

⁴Overall was calculated as sum of the differences from all the diets with spray dried plasma.

136 Optimum Concentration of Spray Dried Plasma for Maximized Growth Performance, Improved Intestinal Health, and Reduced Inflammation in Weaned Pigs Housed in a Challenged

Environment. Hannah M. Bailey¹, Hans H. Stein², Joy Campbell³, ¹University of Illinois, ²University of Illinois at Urbana-Champaign, ³APC, LLC

Abstract: This study aimed at testing the hypothesis that greater inclusion of spray dried plasma (SDP) in diets improves growth performance, intestinal morphology, and reduces inflammation in weaned pigs. Four-hundred weaned pigs (body weight: 6.05 ± 0.80 kg) were allotted to a randomized complete block design with 5 diets and 2 blocks (16 pens/diet; 5 pigs/pen). Pens were not cleaned between groups to create a sanitation challenge. Phase-1 diets containing 0, 2, 4, 6, or 8% SDP were formulated. One pig per pen was sacrificed on d 14 and samples of intestinal tissue and mucosa were collected. Data were analyzed using PROC MIXED of SAS and linear, quadratic, and cubic contrast statements were used. During phase-1, ADG, ADFI, G:F, and body weight of pigs on d 14 increased (linear, $P < 0.05$) with increasing levels of SDP in the diet (Table 1). Villus width in the jejunum of pigs on d 14 tended to increase (linear, $P < 0.10$) with increasing inclusion of SDP (Table 2), and villus height: crypt depth tended to increase (quadratic, $P < 0.10$) with the greatest value observed for pigs fed a diet with 8% SDP. Secretory immunoglobulin A in the jejunal mucosa was decreased when 4 or 8% SDP was included in the diet (cubic, $P < 0.05$). Interleukin- (IL-) 2 (quadratic, $P < 0.10$) and IL-18 (cubic, $P < 0.10$) in the jejunal mucosa tended to decrease at 8% inclusion of SDP and IL-8 (linear, $P < 0.10$) tended to increase as SDP inclusion increased in the diet. In conclusion, the optimal inclusion of SDP in diets for weanling pigs was 8% as indicated by improvements in growth performance, but the collective intestinal morphology and health data do not result in a clearly conclusive optimum concentration in SDP.

Keywords: additivity, apparent total tract digestibility, spray dried plasma