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Effects of steam pelleting and extruding sorghum grain-soybean meal diets on phosphorus availability for swine (1979)

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Effects of Steam Pelleting and Extruding Sorghum Grain-Soybean Meal Diets on Phosphorus Availability for Swine

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Summary

Two feeding trials and three phosphorus balance studies were conducted to compare the effect of steam pelleting, extruding, and grinding on phosphorus availability. The results indicate that steam pelleting or extruding has little, if any, effect on the availability of phosphorus for finishing swine (100 to 220 lbs.).

Introduction

Several attempts have been made to increase the availability of phytate phosphorus (organic plant source phosphorus) through various methods of feed processing. Success with steam pelleting has varied; some workers have shown that pelleting increases the availability of phytate phosphorus, but others have been unable to show any response. We compared grinding, pelleting and extruding and the effects of these processing methods on phosphorus availability for finishing swine.

Procedures

We used 120 crossbred finishing pigs in two feeding trials and three phosphorus balance studies. All diets were ground, mixed, and incorporated into 16% protein diets. Steam pelleted and extruded diets were reground after processing the entire diet to give approximately the same particle size as the ground diets. No supplemental phosphorus and 0.12% added phosphorus were used with each processing method.

In the feeding trials, pigs were group fed (3 pigs/pen, 9 pigs/trt) in 4' x 16' pens with solid concrete floors. Pigs were slaughtered at the end of each trial and the right front leg was removed for determinations of bone breaking strength, and bone ash, calcium and phosphorus.

In the balance studies, pigs were housed in metal metabolism cages allowing for separate collection of feces and urine. Daily feed intake was constant and fed in two equal portions. Fresh water was supplied at each feeding. A five-day, pre-trial period preceded a five-day collection period. Feces and urine were analyzed for phosphorus.

Results and Discussion

The results of the feeding trials are presented in table 29, with bone data in table 30. Adding phosphorus to diets of each processing method increased gains over those with ground diet and no supplemental phosphorus.

When no supplemental phosphorus was added, pigs receiving either pelleted or extruded diets gained slightly, but not significantly more than pigs receiving the ground ration. Bone data are similar to the gain data; adding phosphorus significantly increased ($P<.05$) bone development as measured by bone breaking strength and bone ash, calcium and phosphorus. Pigs receiving either pelleted or extruded diets with no phosphorus added had higher bone ash, calcium, phosphorus, and bone breaking strength values than pigs receiving ground diets with no supplemental phosphorus, but the differences were small.

Pelleting and extruding low phosphorus diets resulted in slightly, but not significantly, increased phosphorus retention; compared with ground diets when no phosphorus was added. Adding phosphorus increased phosphorus retention with each ration over the no supplemental phosphorus diets; while no differences were observed among processing methods with supplemental phosphorus added.

Table 29. Pig Performance as Influenced by Processing Method and Phosphorus Level (Trial 1)[e]

Treatment	ADG (lbs)	Daily intake (lbs)	F/G
Ground	1.52[a]	5.30	3.49[a]
G + 0.12% P	1.72[ab]	5.46	3.19[b]
Pelleted	1.58[a]	5.04	3.17[b]
P + 0.12% P	1.72[ab]	5.24	3.06[bc]
Extruded	1.63[a]	5.19	3.19[b]
E + 0.12% P	1.94[b]	5.50	2.85[c]

Trial 2[f]

Treatment	ADG (lbs)	Daily intake (lbs)	F/G
Ground	1.67[a]	5.65[bc]	3.39[a]
G + 0.12% P	1.89[bc]	5.94[bc]	3.14[b]
Pelleted	1.52[a]	4.71[a]	3.10[b]
P + 0.12% P	1.98[c]	5.59[bc]	2.82[d]
Extruded	1.74[ab]	5.32[ab]	3.07[bc]
E + 0.12% P	1.87[bc]	5.37[bc]	2.87[cd]

[a,b,c,d]Means within column with same superscript are not different ($P<.05$).

[e]Initial weight 106.2 lbs; duration 77 days; 3 pigs/pen, 9 pigs/treatment.

[f]Initial weight 91.2 lbs; duration 74 days; 3 pigs/pen, 9 pigs/treatment.

Table 30. Bone Development as Influenced by Processing Method and Phosphorus Level (Trial 1)

Treatment	Breaking strength[d] (kg/cm^2)	Bone ash[e] (%)	Bone Ca[e] (%)	Bone P[e] (%)
Ground	500^{a}	57.3^{a}	21.9^{a}	11.0^{a}
G + 0.12% P	622^{b}	63.4^{c}	25.0^{b}	11.7^{a}
Pelleted	526^{a}	60.0^{b}	22.8^{ab}	11.7^{a}
P + 0.12%PP	621^{b}	62.0^{bc}	23.3^{ab}	11.6^{a}
Extruded	518^{a}	59.6^{a}	22.5^{ab}	11.6^{a}
E + 0.12% P	621^{b}	62.4^{bc}	24.6^{ab}	12.0^{a}

Trial 2

Treatment	Breaking strength[d] (kg/cm^2)	Bone ash[e] (%)	Bone Ca[e] (%)	Bone P[e] (%)
Ground	470^{a}	63.9^{a}	23.5^{a}	11.9^{a}
G + 0.12% P	769^{b}	66.2^{c}	25.0^{c}	12.6^{c}
Pelleted	507^{a}	64.3^{ab}	24.1^{ab}	12.1^{ab}
P + 0.12% P	760^{b}	66.4^{c}	25.0^{c}	12.6^{c}
Extruded	499^{a}	64.2^{a}	23.9^{a}	12.1^{a}
E + 0.12% P	748^{b}	65.9^{bc}	24.7^{bc}	12.5^{ab}

[a,b,c]Means within same column with same superscript are not different ($P<.05$).

[d]Bone breaking strength conducted on right ulna.

[e]Bone ash, Ca, and P conducted on right radius and reported on dry, fat-free basis.