EFFECTS OF A GRIND & MIX HIGH NUTRIENT DENSITY DIET ON STARTER PIG PERFORMANCE

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Summary

Two 4-wk growth trials utilizing 520, 21-d old weanling pigs (22 ± 2 d and 13.7 lb) were conducted to evaluate either grind & mix (meal form) or pelleted high nutrient density diets on growth performance. One half of the pigs were fed a standard (20% dried whey and 10% plasma protein) high nutrient density diet (HNDD1) either in a pelleted or meal form. The other half received a high nutrient density diet (HNDD2; either pelleted or meal form) formulated with ingredients having greater flowability characteristics in order to determine if pelleting is necessary for pigs fed high nutrient density diets. Each trial was split into two identical phases, with Phase I being d 0 to 9 postweaning and Phase II being d 9 to 28 postweaning. Experimental diets were formulated to 1.5% lysine, .90% calcium, and .80% phosphorus and were fed only during Phase I. All pigs were fed a common diet (meal form) during Phase II formulated to 1.25% lysine containing 10% dried whey and 5% fish meal. There was an interaction between diet form and diet composition for ADG during Phase I (0-9 d) postweaning. Pigs fed meal-form HNDD1 had a slightly higher ADG compared to pigs fed the same diet in a pelleted form. However, pigs fed pelleted HNDD2 grew slightly faster than pigs fed the meal-form of the same diet during Phase I. There were no interactions between diet form and composition for F/G or ADFI during Phase I or during the overall experiment. At d 9 postweaning, there was no difference in F/G between pigs fed HNDD1 or HNDD2. However, pigs fed pelleted diets were more efficient than meal-fed pigs. Overall (d 0 to 28), pigs fed pelleted diets during Phase I, regardless of composition, were more efficient than pigs fed meal diets. Based on the results on this experiment, a high nutrient density diet can be fed in either a meal or pelleted form. Feed efficiency was 20% poorer for pigs fed the HNDD in the meal form. Therefore, a pelleted HNDD can cost up to 120% (excluding bagging expense) of mixing the same diet on-farm and be cost effective. Additional research is needed to understand the interaction between diet form and composition for ADG during Phase I and to improve diet flowability.

(Key Words: Starter, Performance, Process, Diet, Density.)

Introduction

Important research breakthroughs in nutritional programs for the early-weaned pig have occurred in the last decade. Introductions of the high nutrient density diet (HNDD) and three-phase starter program have provided a management method of economically eliminating the postweaning lag often found when feeding simple corn-soybean meal diets to young pigs. Recent research has demonstrated that the HNDD starter diet is not only necessary to optimize growth performance in the nursery, but also to maximize subsequent performance in the grower and finisher phases. This diet has traditionally been high in milk products and necessitated pelleting for flowability, which resulted in increased cost. With new ingredients (i.e., porcine plasma protein) used to formulate the HNDD diet, the potential to on-farm mix the Phase I diet needs to be evaluated. Thus, the objective of this experiment is to evaluate the effects of two diets formulated from ingredients of known differences in flowability fed in two physical forms (pelleted or meal) on early weaned pig growth performance.

Procedures

This experiment was conducted in two identical 4-wk growth trials. A total of 520 21-d old weanling pigs (avg initial wt=13.7 lb) was used to evaluate two diets formulated from ingredients of known differences in flowability fed in two physical forms (pellets or meal). The four experimental treatments were in a 2 × 2 factorial arrangement consisting of two high nutrient density diets (HNDD1 or HNDD2) fed in a meal or a pelleted form. The HNDD2 diet was formulated with ingredients to help eliminate feeder bridging problems. Each trial was split into two phases, with Phase I from d 0 to 9 postweaning and Phase II from d 9 to 28 postweaning. Experimental diets were fed only during Phase I. All pigs were fed a common diet (meal form) during Phase II. Pigs were housed 13 per pen (10 pens per treatment) in 4 ft × 8 ft pens in an environmentally controlled nursery with woven wire flooring and allowed ad libitum access to feed and water. Pigs were weighed, and feed consumption was determined on d 9 and 28 to determine ADG, ADFI, and F/G.

Two experimental diets were used during Phase I (Table 1). These diets were fed in either a meal or pellet form. Diets were formulated to 1.5% lysine, .9% calcium, and .8% phosphorus. The first diet, HNDD1 was a standard Phase I diet containing 10% spray-dried porcine plasma protein, 10% lactose, and 20% edible grade dried whey. Because of anticipated flowability problems, HNDD2 was formulated with only 10% dried whey. Soybean meal was replaced with extruded soy protein concentrate in this diet in an attempt to improve growth performance in a diet with a lowered dried whey content. The Phase II diet contained 1.25% lysine, 10% dried whey, and 5% fish meal.

Results and Discussion

There was an interaction ($P < .05$) between diet form and diet composition for ADG during Phase I (0 to 9 d) postweaning (Table 2). Pigs fed HNDD1 in the meal form had a slightly higher ADG compared to pigs fed the same diet in a pelleted form. However, pigs fed HNDD2 in the pelleted form grew slightly faster than pigs fed the same diet in the meal form during Phase I. The second HNDD was formulated from ingredients that had an improved flowability compared to HNDD1, yet pigs could have wasted more of HNDD2 fed in the meal form. The feeders used in this experiment did not have agitators. The meal diets had noticeably poorer flowability than the pelleted diets. Also, pigs fed HNDD1 in the pelleted form had a numerically lower ADFI compared to pigs fed any other dietary treatment, which could possibly be related to pelleting conditions and less wastage. Additional experiments are needed to fully understand this interaction.

There were no interactions ($P > .18$) between dietary form and composition for F/G or ADFI during Phase I or during the overall experiment. At 9 d postweaning, there was no difference in F/G between pigs fed HNDD1 or HNDD2. However, pigs fed pelleted diets were more efficient ($P < .01$) than pigs fed diets in meal form. These differences in feed efficiency are in agreement with several experiments showing that feed wastage is higher in diets fed in the meal form, resulting in a poorer efficiency compared to pellets.

During Phase II (9-28 d), there were no differences in ADG, ADFI, or F/G among dietary treatments. Because all pigs were fed the same diet in the meal form, similar growth performance is not surprising. Overall (d 0 to 28), there was a tendency ($P < .08$) for an interaction between diet form and diet composition for ADG. This interaction was caused by the previously discussed interaction during Phase I of the experiment. Diet composition had no effect on ADFI or F/G. Pigs fed pelleted diets during Phase I, regardless of composition, were more ($P < .01$) efficient than pigs fed meal diets.

Based on the results of this experiment, a high nutrient density diet can be fed in either a meal or pelleted form. Before feeding the HNDD in the meal form, producers must realize that decreased flowability results in increased feeder management. Feed efficiency was 20% poorer for pigs fed the HNDD in the meal form. Therefore, a pelleted HNDD can cost up to 120% the cost of mixing the same diet on the farm and still be cost effective. Additional research is needed to understand the interaction between diet form and composition for ADG in Phase I and to improve diet flowability.

Table 1. Composition of Diets, %

Ingredient	HNDD1[a]	HNDD2[a]	Phase II
Corn	32.6	45.8	—
Milo	—	—	54.1
Extruded soy protein concentrate	—	16.2	—
Soybean meal (44% CP)	19.3	—	—
Soybean meal (48% CP)	—	—	19.6
Dried whey	20.0	10.0	15.0
Lactose	10.0	10.0	—
Fish meal	—	—	5.0
Porcine plasma protein	10.3	10.0	—
Soybean oil	3.0	3.0	3.0
Monocalcium phoshate (21% P, 18.5% Ca)	2.5	2.6	1.3
Limestone	.7	.9	.4
Salt	—	—	.2
Lysine•HCL, 98%	—	—	.2
Dl-methionine, 99%	.8	.7	—
Vit/trace min/antibiotic	.7	.7	1.1
Copper sulfate	.1	.1	.1
Total	100.0	100.0	100.0

[a]HNDD1=high nutrient density diet one; HNDD2=high nutrient density diet two.

Table 2. Effect of Physical Form (Meal or Pellet) of a HNDD on Growth Performance in Starter Pigs[a]

	HNDD1[b]		HNDD2[b]		
Item	Pellet	Meal	Pellet	Meal	CV
0-9 d					
ADG, lb[c]	.46	.49	.50	.45	12.6
ADFI, lb[d]	.50	.63	.53	.59	13.3
F/G[d]	1.08	1.27	1.08	1.31	9.9
9-28 d					
ADG, lb	.70	.73	.74	.73	9.0
ADFI, lb	1.19	1.24	1.22	1.23	6.0
F/G	1.70	1.71	1.65	1.70	5.9
0-28 d					
ADG, lb[e]	.62	.65	.67	.64	9.0
ADFI, lb[e]	.96	1.05	1.01	1.02	7.3
F/G[d]	1.55	1.62	1.50	1.59	4.3

[a]A total of 520 pigs, 13 pigs/pen, 10 pens/treatment.
[b]HNDD1 = High nutrient density diet one; HNDD2 = High nutrient density diet two.
[c]Interaction of diet form × diet composition ($P<.05$).
[d]Main effect of meal vs pellet ($P<.01$).
[e]Interaction of diet form × diet composition ($P<.08$).

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