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Pen Space Allocations and Pelleting of Swine Diets

Mike Brumm[1]

Summary and Implications

An experiment was conducted to determine whether an interaction exists between pen space allocation (14 versus 19 pigs per pen in 8 x 14 ft pens) and physical form of the diet (meal versus pellet) in a fully slatted facility. There were no interactions between diet form and pen space allocation for daily gain, feed intake or feed conversion efficiency. Pigs fed pelleted diets had a 2.3 percent improvement in daily gain and a 7.9 percent improvement in feed efficiency. Although pigs housed 14-per-pen grew faster than those housed 19-per-pen with no difference in feed conversion efficiency, pigs in the 19-pig pens produced 30 percent more live weight gain per square foot of pen space during the 106-day trial. There were no differences in death loss or body weight variation within the pens of pigs. These results suggest the response to pelleting is similar, regardless of pen space allocations and that pen space allocations affect not only pig performance, but also weight gain per unit of pen space. This has implications for income-per-unit of facility cost.

Introduction

As pork producers increase their investments in confinement facilities, they increasingly pay attention to management practices to increase the net income-per-unit of space. This generally means space allocations for growing-finishing pigs are less than those considered optimal for maximum daily gain and feed conversion efficiency. As a consequence of these space restrictions, daily feed intake is reduced. There are reports in the scientific literature indicating this reduction in feed intake associated with space restrictions can be modified if the diet is pelleted. The purpose of the following experiment was to examine whether an interaction exists between pen space allocation and physical form of the diet (pellet or meal).

Methods

Terminal-cross barrows and gilts were allotted to treatments consisting of either 14 or 19 pigs per pen (8 versus 5.9 ft^2/pig, respectively). The pigs were offered diets either as pellets or in meal form from arrival following purchase to slaughter.

The experiment was conducted at the University of Nebraska's Northeast Research and Extension Center at Concord from November, 1996 to March, 1997. The facility was a fully slatted, double-wide, naturally ventilated barn with fresh water under-slat flushing for manure removal. Pen size was 8 ft x 14 ft. There were two nipple drinkers and four feeder spaces provided in each pen.

Diets were formulated to contain 1.00, 0.95, 0.85 and 0.70 percent lysine and were switched on the week that individual pens of pigs averaged 80, 130 and 190 lb live weight, respectively. The ingredient composition of the meal and pellet diets was identical, as was the fineness of grind (Table 1). The only difference in diet form was the steam conditioning and pelleting of the pellet diet.

Results

Originally, the experimental design called for the collection of carcass

Table 1. Experimental diets

Item	Pig bodyweight, lb			
	40-80	80-130	130-190	> 190
Ingredient				
Corn	1164	1199	1278	1388
Soybean meal, 44% CP	430	395	320	211
Wheat midds	300	300	300	300
Cane molasses	50	50	50	50
Calcium carbonate	21	21	21	23
Dicalcium phosphate	17	18	14	12
Salt	7.5	7.5	7.5	7.5
Lysine•HCl	3	3	3	3
Vitamins/trace minerals	7.5	6.0	6.0	6.0
Calculated analysis				
Energy, ME/lb[a]	1447	1448	1455	1460
Lysine, %	1.00	.95	.85	.70

[a]ME = metabolizable energy

Table 2. Effect of experimental treatments on pig performance

Item	Diet form		Pigs/pen		SE[a]	*P* values	
	Meal	Pellet	14	19		Diet	Space
No. pens	8	8	8	8			
Pig weight, lb							
Initial	42.9	42.6	42.7	42.9	.2		
d 106	229.3	233.3	235.3	227.3	1.1	<.05	<.01
CV d 106[b]	7.8	8.0	8.1	7.7	.4	NS	NS
Average daily gain, lb	1.76	1.80	1.82	1.74	.01	<.05	<.01
Average daily feed, lb	5.57	5.25	5.56	5.26	.06	<.01	<.01
Feed:gain	3.17	2.92	3.06	3.02	.03	<.01	NS
No. pigs dead	0	3	1	2		NS	NS

[a]Standard error.
[b]Coefficient of variation for pig weight at day 106.

lean and hot carcass weight on individually identified pigs, with entire pens slaughtered on the week the heaviest pig in the pen weighed 280 pounds or greater. On the second week of slaughter, however, a consulting veterinarian diagnosed pigs with a respiratory complex (most likely pasteurella pneumonia with secondary mycoplasma pneumonia). Because performance was severely compromised during the previous week, pig performance data are only reported to day 106 of the experiment, when the first pigs weighed at least 280 pounds.

The only interaction of diet form and space allocation occurred within pen weight variation as measured by CV (coefficient of variation) on day 106. Pigs fed pelleted diets had an increase of within pen CV when the number of pigs per pen increased from 14 to 19 (7.5 versus 8.5 percent). The CV decreased, however, if the diet was in meal form when the number of pigs per pen increased from 14 to 19 (8.7 versus 6.9 percent). However, the overall CV's are low compared to previous research trials, and the amount of change between the various treatments was small.

Table 2 presents the main effects of diet form and pen space allocation on pig performance to day 106. Pelleting the diet resulted in an improvement ($P < .05$) in daily gain and feed efficiency and a decrease ($P < .01$) in daily feed intake. The 7.9 percent improvement in feed efficiency for the pellet versus meal diets is typical of other reports and within the 5-8 percent range suggested by the University of Nebraska's Swine Nutrition Guide. The 2.3 percent improvement in daily gain is just under the 3-6 percent suggestion in the same publication. The slightly lower daily gain response may be explained because the experiment was conducted during the winter.

Increasing the number of pigs per pen from 14 to 19 resulted in a decrease ($P < .01$) in both daily gain and daily feed intake, with no effect on feed conversion efficiency. These results agree with earlier published studies from the same research facility documenting a consistent decrease in daily feed intake and daily gain when pen space allocations are decreased, but an inconsistent response on feed conversion efficiency.

Another method of comparing pig performance is to calculate the net pounds of gain per square foot of pen space during the 106-day period. The 19-pig pens averaged 31.3 lb of live weight gain per square foot of pen space versus 24.1 lb of gain for the 14-pig pens, a 30 percent increase, with no difference in death loss or weight variation within pens.

Three pigs of the original 264 pigs died. Causes of death were twisted gut, bleeding ulcer and undetermined. There was no effect ($P>.15$) of experimental treatment on death loss, although all three pigs were offered pelleted diets.

Conclusion

Unlike previously published reports in the scientific literature, these results suggest no interaction between pen space allocation and physical form of the diet for growing-finishing pigs. The response to pelleting was similar for crowded and uncrowded pigs for both daily gain and feed conversion efficiency.

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