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Effects of Stocking Density on Lightweight Pig Performance Prior to Marketing[1]

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Summary

A total of 336 finishing gilts (initially 258 lb) were used in a 21-d growth trial to evaluate the effects of increasing stocking density on performance of pigs classified in the slower-growing fraction of the pig population. Pens of gilts were blocked to minimize variation associated with barn location and the diet fed for the 14 d prior to the start of this trial. Within each block, pens of pigs were randomly allotted to treatments (6 pens per treatment). Treatments included stocking pens with 8, 12, 16, or 20 pigs per pen, allowing 22.5, 15.0, 11.3, and 9.0 ft^2/pig, respectively. Pens were weighed and feed intake determined on d 0, 7, 14, and 21 to calculate ADG, ADFI, and F/G. Pigs were fed a common diet with the inclusion of 4.5 g/ton Ractopamine HCl (RAC) (Paylean; Elanco Animal Health, Greenfield, IN) for the duration of the trial.

Overall, as the number of pigs per pen increased, ADG and ADFI decreased (ADG and ADFI: linear, $P < 0.01$; ADFI: quadratic, $P = 0.01$), but no differences were measured in F/G. These performance differences resulted in numeric differences in pig weights (8 pigs: 316.6 lb, 12 pigs: 308.8 lb, 16 pigs: 310.9 lb, and 20 pigs: 307.0 lb) on d 21. These data indicate that in this commercial finishing barn, finisher pig ADG and ADFI improved as the number of pigs in each pen decreased. These findings suggest that as pigs are held in barns for extra days to add weight, their growth rates may be affected by stocking density.

Key words: growth, lightweight pig, stocking density

Introduction

Strategic planning is often necessary to manage the lightweight pig population in finishing barns around the time of marketing. Management practices to improve the growth rate of these slower-growing pigs and allow them to reach market weight in the available amount of time are primarily limited to dietary modifications, altering pen stocking density, and avoiding excessive pig movements. For the majority of the finishing phase, the recommendations for finishing pig stocking density vary from 6.0 to 9.0 ft^2/pig, but these recommendations depend on whether the producer wishes to optimize growth rate or economic return. These recommendations also are guidelines for barn-loading strategies. For determining barn-unloading strategies, especially strategies to manage the tail-end, lightweight pigs, data are limited. Often as pigs are marketed from finisher barns, pens will become empty, but not in a uniform manner. Previous work has indicated that mixing pigs prior to market will not be detrimental to pig perfor-

[1] Appreciation is expressed to J-Six Enterprises, Seneca, KS, for their assistance and for providing the pigs and facilities used in this experiment.

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mance as long as pigs are given at least 2 weeks in their new environment.[5] In these trials, the expected impact of remixing the lightweight tail-end pigs on growth rate and feed intake was less than expected, and the effect of stocking density was greater than expected. Therefore, moving and reorganizing pen structures could be a viable option for producers if an optimum stocking density was identified. This technique may be especially useful in multiple barn sites where additional grow-out days can be achieved for the lightweight pigs while other barns on the site are being cleaned. The objective of this trial was to determine the effects of moving pigs to different stocking densities (22.5, 15.0, 11.3, and 9.0 ft^2/pig) on pig performance prior to market.

Procedures

The Kansas State University Institutional Animal Care and Use Committee approved the procedures used in this study. This experiment was conducted in a standard, double-curtain-sided, research finishing barn in northeast Kansas. All pens had slatted concrete flooring, were 10 ft by 18 ft, and were equipped with a single-sided dry, 3-hole, stainless steel feeder (AP-3WFS-QA; Automated Production Systems, Assumption, IL) and a dual swinging water source (Trojan Plastic Waterswing; Trojan Specialty Products, Dodge City, KS), allowing pigs to have ad libitum access to feed and water. Each hole in the conventional dry feeder was 14 in. long. The barn was equipped with an automated feeding system (FeedPro; Feedlogic Corp., Willmar, MN) to allow recording of feed delivery to individual pens.

A total of 336 market age but lightweight commercial gilts (approximately 28 wk of age and 258 lb) were used to determine the effects of increasing pen-stocking density on pig performance prior to marketing. On d 0, 24 test pens were blocked to account for barn location and diet previously fed and allotted to 1 of 4 stocking density treatments (6 pens per treatment). Treatments were stocking pens with 8, 12, 16, or 20 pigs per pen, allowing 22.5, 15.0, 11.3, and 9.0 ft^2/pig and 5.3, 3.5, 2.6, and 2.1 in. of feeder length per pig, respectively.

A simple protocol was followed to stock the new test pens with pigs from pens previously occupied in the barn (original pens). From the original occupied pens within the barn, pigs were identified by the diet fed for the previous 14 d (gilts fed a diet without added RAC; gilts fed a diet without RAC for 7 d then fed a diet with 4.5 g/ton RAC for 7 d, or gilts fed a diet with 4.5 g/ton RAC for 14 d). Within each diet group, gilts were gate-cut (randomly selected) from their original pens to the new test pens according to the block and treatment assignments of the new pens. Test pens consisted of gilts from a minimum of 2 original pens, forcing each pen of gilts to establish a new social structure. Once on test, all pigs were fed a common diet with the inclusion of 4.5 g RAC/ton of complete feed.

Pens of pigs were weighed and feed intake was determined on d 0, 7, 14, and 21. Due to severe lameness, 1 pig from a single pen of 20 pigs was removed during the trial. Although weight and pig days associated with this removed pig were accounted for in the data analysis, no adjustment was made in the pen during the trial to account for the additional space per pig remaining in the pen.

[5] Potter et al., Swine Day 2010. Report of Progress 1038, pp. 223-226.

Data were analyzed as a randomized complete block design with stocking density treatment as a fixed effect and block as a random effect using the GLIMMIX procedure in SAS (SAS Institute, Inc., Cary, NC). Pen was the experimental unit for the analysis. The effects of increasing stocking density on performance were determined by linear and quadratic polynomial contrasts.

Results and Discussion

Stocking density affected ADFI (linear, $P < 0.001$; Table 1) and ADG (linear, $P < 0.001$) but not F/G within the first 7 d of this trial. From d 7 to 14 and d 14 to 21, stocking density did affect ADFI (linear, $P \leq 0.01$; d 14 to 21: quadratic, $P < 0.01$) but not growth rate (linear and quadratic, $P \geq 0.41$). The only tendency for an effect of stocking density on F/G was from d 14 to 21, when F/G improved (linear; $P = 0.06$) as the number of pigs per pen increased.

Overall, decreasing stocking density increased ADG (linear, $P < 0.01$) and ADFI (linear, $P < 0.001$; quadratic, $P = 0.01$) but did not influence F/G. These performance differences throughout the trial resulted in numeric differences in final weight on d 21, with pigs stocked at 8 pigs per pen (316.6 lb) numerically heavier than pigs stocked at 12 (308.8 lb), 16 (310.9 lb), or 20 (307.0 lb) pigs per pen.

These results indicate that the number of pigs per pen had an impact on pig performance prior to marketing even when the pigs were classified as the slower-growing lightweight fraction of pigs in the barn. Findings from a previous study evaluating different stocking densities along with mixing status also suggested that the stocking density of the pen had a larger impact on performance than the mixing status.[6] In that study, pigs were stocked with either 12 or 20 pigs per pen.

Our study provides additional evidence that lightweight pig performance is influenced by stocking density. The effect was most pronounced during the first week after mixing; however, the improvements in growth rate and feed intake demonstrated by pigs in pens stocked with 8 pigs suggest that the stocking density to maximize lightweight pig performance just prior to marketing has not yet been established and may be achieved by providing pigs with at least 22.5 ft^2/pig.

Additionally, other factors known to affect pig performance also were altered as stocking density changed in this trial, including feeder length and access per pig, water access per pig, and floor space available per pig. The improvements seen in this trial with the reduction in number of pigs per pen may be a result of just one of these factors or may have occurred as a result of a combination of these factors. However, from a practical standpoint, our procedures mimic how remixing would occur in typical production conditions because additional water or feeder access would not be provided.

Nevertheless, these results indicate that as the number of pigs per pen was reduced, feed consumption and subsequent growth rate was increased. Stocking pigs at lower densities will improve performance of lightweight pigs prior to marketing and potentially result in less time necessary for slower-growing pigs to reach the targeted market weight.

[6] Potter et al., Swine Day 2010. Report of Progress 1038, pp. 223-226.

Table 1. Effect of stocking density on performance of lightweight gilts prior to marketing[1]

	Stocking density, pigs per pen[2]					Probability, $P <$	
Item	8	12	16	20	SEM	Linear	Quadratic
d 0 to 7							
ADG, lb	3.04	2.33	2.15	1.93	0.220	<0.001	0.23
ADFI, lb	8.31	6.61	6.47	5.96	0.350	<0.001	0.06
F/G	2.76	3.03	3.27	3.19	0.330	0.19	0.49
d 7 to 14							
ADG, lb	3.04	2.82	2.88	2.80	0.175	0.41	0.67
ADFI, lb	8.80	7.93	7.77	7.75	0.271	0.01	0.13
F/G	2.96	2.88	2.72	2.77	0.147	0.28	0.66
d 14 to 21							
ADG, lb	2.34	2.01	2.44	2.24	0.128	0.82	0.64
ADFI, lb	8.86	7.75	7.95	7.71	0.211	<0.001	<0.01
F/G	3.93	3.87	3.29	3.49	0.231	0.06	0.54
d 0 to 21							
ADG, lb	2.80	2.39	2.49	2.32	0.083	<0.01	0.15
ADFI, lb	8.66	7.43	7.40	7.14	0.196	<0.001	0.01
F/G	3.10	3.11	2.99	3.08	0.081	0.58	0.64
Weight, lb							
d 0	257.7	258.6	258.6	257.7	3.70	0.99	0.81
d 7	279.0	275.0	273.7	271.2	3.63	0.12	0.82
d 14	300.2	294.7	293.8	291.4	3.88	0.12	0.68
d 21	316.6	308.8	310.9	307.0	3.97	0.15	0.62

[1] Initially, a total of 336 gilts were used to determine the effects of stocking density on pig performance just prior to marketing. On d 0, pens of pigs (6 pens per treatment) were blocked to account for barn location and the diet fed for the previous 14 d (gilts fed a diet without added Ractopamine HCl [RAC; Paylean; Elanco Animal Health, Greenfield, IN], gilts fed a diet without RAC for 7 d and fed a diet with 4.5 g/ton RAC for 7 d, or gilts fed a diet with 4.5 g/ton RAC for 14 d) and randomly assigned to 1 of 4 stocking density treatments. Gilts were mixed from a minimum of 2 original pens to create new mixed gilt pens, each stocked at 1 of 4 stocking densities. Beginning on d 0, all pigs were fed a common diet with added RAC (4.5 g/ton).
[2] Stocking density treatments were stocking pens with 8, 12, 16, and 20 pigs per pen (6 pens per treatment), providing approximately 22.5, 15.0, 11.3, and 9.0 ft^2/pig and 5.3, 3.5, 2.6, and 2.1 in. of feeder length per pig, respectively.