Early Weaned Pig Performance in Hoop Structures During Early Summer

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Summary and Implications

Four groups of early weaned pigs (19 days of age) from the ISU Southwest Swine Research Farm, Atlantic, IA were delivered to the Hoop Research Complex at the ISU Rhodes Research Farm, Rhodes, IA, in late May and early June 1998. Three groups of pigs (n=552) were placed in three (30–ft × 60 ft) deep bedded hoop structures. The fourth group (n=159) was placed in a mechanically ventilated modular confinement building with total slatted floors. Pig performance was good for both housing systems. During the 26-day trial, hoop pigs ate 14% more feed than the confinement pigs (P<.004). The average daily gain (ADG) for the 26-day trial was (26%) more for the hoop pigs than those in confinement (P<.004). The 0−14 day gain-to-feed ratio was higher for the hoop pigs (P<.03) than the confinement pigs. Mortality was very low (3 of 711). By starting early weaned pigs in hoops during the spring and fall, wean-to-finish production may be an acceptable strategy for producers with hoop structures.

Introduction

Recently, an alternative swine housing system, hoop structures, has gained popularity. Galvanized pipe arches or hoops give the Quonset-shape appearance to the hoop structure or hoops. The hoops are covered with UV-resistant, polyethylene fabric tarp that is stretched tight using rope or ratchets. A hoop structure for grow–finish pigs consists of a concrete pad with waterers and feeders at the south end. The remaining area is bedded for pig dunging and sleeping.

Hoop structures were originally developed in Manitoba, Canada. Early research conducted by M.L. Conner of University of Manitoba, Winnipeg, showed that hoop structures worked well for grow–finish pigs and gestating sows in Canada (1,2). ISU has also shown that hoop structures will work for gestating sows and grow–finish pigs in the Midwest (4,5).

Economic, environmental, and animal welfare considerations are the main driving forces behind the adoption of alternative swine housing systems such as hoop structures. More information is needed on pig performance in hoop structures in the Midwest.

In 1979, the concept of Medicated Early Weaning (MEW) was developed. Now, early weaning technologies are called segregated early weaning (SEW). Early weaning (<21 days of age) and segregation (i.e. removal of the pigs from contact and exposure to the sow,) produces high-health-status animals that have improved feed efficiency and growth rate compared with pigs conventionally weaned.

A new trend in the swine industry is to put early weaned pigs in confinement finishing barns. This is called wean-to-finish production. With wean-to-finish production, the movement of pigs between buildings is eliminated. By starting early weaned pigs in hoops, wean-to-finish production may be an acceptable strategy for maintaining pig performance, without the moving and remixing done on many farms.

In the winter of 1997–1998 the Hoop Research Complex (HRC) was constructed at the ISU Rhodes Research Farm, Rhodes, Marshall Co., IA. The facility was designed to provide more information on pig performances in hoops in the Midwest. Three hoops and a small confinement unit were built to conduct research testing. Comparing the two production systems provides information for improved hoop management in the future. Confinement housing was selected for the comparison baseline because confinement housing and diets are prevalent.

The objectives of the study were to document the performance of early weaned pigs in hoops and to compare early weaned pig performances in hoops to a known baseline of pig performance in a confinement housing system.

Materials and Methods

Four groups of early weaned pigs (about 19 days of age) from the ISU Southwest Swine Research Farm were delivered to the HRC. The pigs were weighed, ear tagged, and injected with ivermectin, penicillin, and then transported 3 hours to the HRC. Seven hundred-eleven pigs from two sow lines were used for this experiment (Table 1). The sow lines were Yorkshire–Landrace F1 (Y × L), and 1/4 Yorkshire−1/4 Landrace−1/2 Hampshire (YL × H). All pigs were sired by Duroc terminal-cross boars. All pigs were from first parity gilts and were farrowed in environmentally controlled rooms in elevated stalls with perforated flooring.

Three groups of pigs (n=552) were placed in three 30 ft × 60 ft hoop structures. Pigs entered the hoops on May 21, May 28, and June 1, 1998. There were 166–209 pigs per group and no pig under 7 lb at weaning accepted. The number of litters in the farrowing room and number of pigs/litter determined the group sizes.

On June 4, 1998 the fourth group (n=159) was placed in the mechanically ventilated modular

confinement building with total slatted floors. The confinement pigs were allotted to six pens and balanced by weight, sex, and breed. There were 26–27 pigs per pen (13.5 ft × 13 ft) in the confinement building. Standard early weaned pig management procedures were followed. The starting temperature setting was 85°F in the confinement unit. From June 18–July 6 the temperature was decreased 2°F every other day.

Typical stocking densities for finishing pigs in hoops is 12-ft^2/pig and confinement is 8-ft^2/pig (3). Typical stocking density for early weaned pigs in a confinement nursery is 3-ft^2/pig. Because early weaned pigs are so small, the increased stocking density in the hoops during the 26-day trial was not a performance-limiting factor. Densities for the trial were 10.8 ft^2–8.6-ft^2/pig in the hoops and 6.8-ft^2–6.5 ft^2 for confinement.

Each hoop was bedded with 4.5–5 large round bales of cornstalks (1,120 lb–1,175 lb each). The bales were uniformly spread throughout the bedded area of the hoop. Additional six standing round bales were placed intact in the bedding area of the hoop. These bales were spaced into two rows the length of the hoop. The extra standing bales were placed in the hoop for future bedding use.

At the beginning of the trial, the north ends of the hoops were closed with a tarp, except for a small opening at the top. The south end remained open, except for solid paneling on the gates. The north end was closed to reduce drafts. After 28 days the north end tarps were removed to allow optimum airflow.

The trial started during early summer weather conditions. Low temperatures for the first 2 weeks of the trial ranged from 43°F–64°F with an average low of 54°F. The high temperatures for the first 2 weeks of the trial ranged from 57°F–90°F with an average high of 70°F. The low temperatures for the 26-day trial ranged from 43°F–73°with an average of low temperature of 57°F. The high temperatures for the 26-day trial ranged from 57°F–91°F with an average high of 74°F.

All pigs received the same pelleted diets (Table 4). Three pelleted commercial early wean diets were fed in phase. Each diet was medicated with 50 g/ton of carbadox. For the first 8 days the pigs were manually fed three times daily on feeding mats. The next 7 days the pigs were manually fed twice daily. For the last 11 days of the trial the pigs were fed ad libitum. The pigs were gradually changed from feeding on mats to feeding in the feeders. Five feeding mats (4 ft × 6 ft) per hoop building were used, and one mat (4 ft × 4 ft) per pen was used in the confinement structure for the first 8 days of the trial. Self-feeders were in the pens and feed was gradually added to them during the first 8 days of the trial.

Hog troughs (6 ft in length) were used to water the pigs in the hoops. Two troughs were used in each hoop for the first 2 weeks and one trough was used for the third week. Also, two automatic waterers (bowl type) were available at all times. Lids were removed from the automatic waterers. The confinement pigs were offered water in pans for the first 3 weeks. Nipple waterers were available at all times for the confinement pigs.

The pigs were weighed individually at the beginning (0 days), midway (14 days), and the end (26 days) of the trial.

Results and Discussion

Pig performance was good for both housing systems throughout the 26-day trial. The pigs were in excellent health and only two died during the 26-day trial. Average daily feed intake (ADFI) for the first 14 days of the trial was similar between the hoop and confinement pigs (P>.10) (Table 3). This was expected because the pigs were limit fed. Hoop pigs ate 27% more feed than the confinement pigs for days 15–26 (P<.001). The higher feed intake in hoops may have been due to cooler environmental temperatures, which stimulated the pig's appetite. The increase in feed intake during days 15–26 resulted in an increase in overall ADFI for the 26-day trial (P<.004). For the entire trial the pigs ate 14% more feed than the confinement pigs.

The hoop pigs grew faster than confinement pigs. Average daily gain (ADG) for the 26-day trial was 27% faster for the hoop pigs than the confinement pigs (P<.003) (Table 3). The hoop pigs were approximately 4 lb heavier at the end of the trial.

The 0–14 day gain to feed ratio was higher for the hoop pigs (P<.03) (Table 3). The 15–26 days and the overall (0–26) gain-to-feed ratios were similar for the two production systems (Table 3).

At the end of the trial, the pigs were uniform in weight. In a 10-lb weight range (± 5 lb of mean), there were 78% of hoop pigs and 81% of the confinement pigs. There were fewer light pigs (<18 lb), however, in the hoops (1.4%) than in confinement (6.9%), which may be due to the lower average pig weight found in the confinement (23 vs. 27 lb/pig) (Table 2).

Sow lines and gender are shown in Table 1 but were not specifically selected for. The number of litters in the farrowing room and pigs weaned per litter determined the group sizes used in the project. The differences between hoop and confinement for genetics (sow line) and gender are not expected to affect pig performance at this young age.

Early weaned pigs performed well in hoops in moderate temperature conditions. The hoop pigs grew faster and were more efficient during the first 2 weeks of the trial than pigs in confinement. Overall (0–26 days) the hoop pigs ate more feed and grew faster but did not differ in feed efficiency than pigs in confinement. The bedding in the hoop structure was important in allowing the pigs to create a good microenvironment. The hoops may not be practical for starting early weaned pigs during colder seasons. Management (i.e. feeding, observation, and watering) is important in all systems for early weaned pigs.

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References

1. Conner, M. L., D. L. Fulawaka, and L. Onischuk. 1997. Alternative low-cost group housing for pregnant sows. Proc. of 5th Intl. Symp.; Am. Soc. Agric. Eng. St. Joseph, MI.

2. Conner, M. L. 1994. Update on alternative housing for pigs. Manitoba Swine Seminar Proceedings 8: 93–96.

3. MWPS. 1997. Hoop structures for grow-finish swine. AED-41. Midwest Plan Service. Ames, IA.

4. Honeyman, M. S. 1997. Hooped structures with deep bedding for grow-finish pigs. ASL-R1392. 1996 Swine Research Reports. P. 107-110. Iowa State University Extension, Ames, IA.

5. Honeyman, M. S. 1997. Gestating sows in deep-bedded hoop structures. ASL-R1496. 1997 Swine Research Reports. P. 60–66. Iowa State University Extension, Ames, IA.

Table 1. Beginning average age, number of pigs per treatment, and distribution of pigs by sow lines and gender.

	Hoop	Confinement
Beginning age (days)	19.8	19.4
Number of pigs	552	159
Sow Lines		
% Y × L	72%	59%
% YL × H	28%	41%
Gender		
% barrow	53%	47%
% gilts	47%	53%

Y × L= Yorkshire × Landrace.
YL × H= Yorkshire/Landrace × Hampshire.

Table 2. Beginning average weight, 14-day weight and 26-day weight of early weaned pigs in early summer.

	Beginning wt (lb)	14–day wt (lb)	Ending 26–day wt (lb)
Hoop	12.3	18.0	27.0
Confinement	11.5	16.3	23.1

Table 3. Performance of early weaned pigs in hoop and confinement housing during early summer.

	Days	Hoop	Confinement
ADFI			
	0–14	.57	.58
	15–26	1.30[a]	1.02[b]
	0–26	.90[c]	.79[d]
ADG			
	0–14	.40[e]	.30[f]
	15–26	.76[a]	.62[b]
	0–26	.57[c]	.45[d]
G:F			
	0–14	.63[e]	.52[f]
	15–26	.57	.60
	0–26	.59	.56

[ab]Means in a row with different superscripts differ (P<.001).
[cd]Means in a row with different superscripts differ (P<.004).
[ef] Means in a row with different superscripts differ (P<.03).
ADFI= average daily feed intake.
ADG= average daily gain.
G:F= gain-to –feed.

Table 4. Calculated analysis of commercially pelleted diets.

		Diets as-fed basis		
	Units	1	2	3
Crude protein	%	22.09	22.30	19.14
Dry matter	%	90.88	90.32	89.56
Crude fiber	%	1.26	1.66	2.11
Fat	%	7.14	6.15	6.04
ME	kcal/lb	1588	1615	1584
Calcium	%	1.32	1.06	1.04
Phosphorus	%	.95	.82	.68
Lysine	%	1.75	1.60	1.22

ME =Metabolizable energy.