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Effect of Slatted Floor Type on Performance of Swine Grown During Cold

David Ames and Dennis Brink

Summary

Average daily weight gain, feed consumption, and feed efficiency were determined for growing finishing swine reared on metal (aluminum) as opposed to plastic, slatted floors at ambient temperatures of 17, 32, 41 and 46° F. Performance was significantly ($P < .05$) improved with plastic slats at 17 and 32° F.

Introduction

Energy exchange between swine and their environment is by radiation, evaporation, convection, and conduction. For pigs reared in cold environments, the primary avenues of heat loss are radiation, convection and conduction (known as sensible avenues of the exchange). Energy loss by these avenues is reflected in reduced animal performance because heat loss must be countered by an increase in heat production which increases maintenance requirements. Hence, cold environments lower the efficiency of swine as they use more feed energy for maintenance.

The rate of heat loss by conduction (energy exchange through a medium or between objects in physical contact) depends primarily on the temperature gradient (i.e., the difference between temperature of the animal and the floor) and the conductivity of the materials. In the case

of swine reared on slatted floors during cold, the conductivity of the flooring may affect performance of animals exposed to different temperatures. It has been speculated that materials having low heat of conductivity may prove advantageous from a performance viewpoint. For example, aluminum slatted floors would have a greater conductivity compared to plastic and, therefore, the rate of heat loss by conduction would be greater in the metal slats. Thus, maintenance costs would be higher and performance lower for animals housed on metal compared to those reared on plastic flooring.

This experiment was designed to determine if differences in conductivity of flooring accounts for differences in performance of swine, and if so, at what ambient temperatures the differences are apparent.

Procedure

Growing, finishing pigs (four per group) were exposed to four ambient temperatures (46, 41, 32 and 17° F), while being reared on aluminum or plastic slatted floors in an environmentally controlled room. They were tested for 14 days with feed consumption, average daily gain, and average feed efficiency for both groups calculated at the termination of the trials. Pigs were randomly allotted at the beginning of each trial.

Results and Discussion

Results of this series of four trials shown in table 12.1 show clearly that at 32 and 17°F there is a significant difference in the performance of swine reared on metal as compared to plastic slats. Pigs on plastic slats in both cases had a 13% improvement in feed efficiency over pigs reared on aluminum slats. Daily feed consumption and average feed efficiency values correlate closely with expected results based on average daily gain data. There was no significant difference in performance on metal and plastic slats at either 41 or 46°F. Daily feed intake per unit of metabolic size was lower at 46°F than at lower temperatures suggesting that trials did represent environments below and above the pigs critical temperature which would agree with observations relating to behavior of pigs reared on both plastic and metal slats. At 32 and 17°F, regardless of the type of flooring material, pigs had a distinct behavior pattern typical of cold: piling and huddling of pigs. Conversely at 46°F, hogs dispersed over the floor area, a usual behavior response to heat stress.

Performance data and behavioral observations indicated that when pigs were subjected to 46°F, the temperature was above their thermal neutral zone and that conversely, when temperatures were 32 and 17°F, the hogs were cold stressed. Hence for these pigs the critical temperature was higher than 32°F and lower than 46°F. As expected, average daily gain and feed efficiency were greatest at 41°F (table 12.1) nearest the apparent critical temperature. It is evident that during cold, pigs reared on plastic slats performed significantly better than did those reared on metal slats. That is explained by the premise that the high conductivity of the metal slats increased conductive

heat loss during cold and resulted in increased maintenance requirements. Increased maintenance requirements then resulted in the differences observed in pig performance.

Of practical significance is the fact that flooring material can affect the performance of swine reared in the cold and that, for pigs of the weights studied here, the critical temperature is between 32°F and 46°F. It should be noted that as swine grow and, hence, deposit more backfat, the critical temperature is lowered and that, conversely, smaller swine (or those with less backfat) have higher critical temperatures.

Table 12.1.^a

Ambient temperature °F	Average beginning weight (lbs.)		Average daily gain (lbs./da.)		Average daily consumption (lb./kg. ^{3/4})	Average feed efficiency (lbs. feed/lb. gain)	
	Metal	Plastic	Metal	Plastic		Metal	Plastic
46°	151.6	149.6	1.32	1.40	0.25 ^a	4.90	4.01
41°	90.0	91.5	1.58	1.57	0.33 ^b	3.70	3.30
32°	113.5	112.2	1.25*	1.52	0.34 ^b	5.31	4.02
17°	133.5	131.0	1.50*	1.93	0.37 ^b	5.43	4.16

^{ab} Columns with different superscripts are significantly different ($P < .05$).

* Significantly different ($P < .05$) within rows (metal vs. plastic).