Kansas Agricultural Experiment Station Research Reports

Volume 0
Issue 10 *Swine Day (1968-2014)*

Article 348

1987

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Recommended Citation

Nichols, David A.; Thaler, R C.; Murphy, James P.; Hines, Robert H.; and Nelssen, Jim L. (1987) "The value of drip versus spray cooling at two flow rates to reduce heat stress of finishing swine," *Kansas Agricultural Experiment Station Research Reports*: Vol. 0: Iss. 10. https://doi.org/10.4148/2378-5977.6188

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Abstract

One hundred fifty pigs were used to evaluate the effectiveness of either spray cooling or drip sprinkling to reduce heat stress in finishing swine. In addition, water flow rates of .2 gal/pig/hr and .4 gal/pig/hr were compared. All wetting treatments significantly (P<.01) improved average daily gain and feed intake (P<.05) compared with non-wetted control. No differences were observed in feed to gain ratio among treatments. Drip sprinkling at the higher flow rate resulted in performance equal to that with intermittent spray cooling at both flow rates.; Swine Day, Manhattan, KS, November 19, 1987

Keywords

Swine day, 1987; Kansas Agricultural Experiment Station contribution; no. 88-125-S; Report of progress (Kansas State University. Agricultural Experiment Station and Cooperative Extension Service); 528; Swine; Drip vs. spray cooling; Heat stress; Finishing swine

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THE VALUE OF DRIP VERSUS SPRAY COOLING AT TWO FLOW RATES TO REDUCE HEAT STRESS OF FINISHING SWINE

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Summary

One hundred fifty pigs were used to evaluate the effectiveness of either spray cooling or drip sprinkling to reduce heat stress in finishing swine. In addition, water flow rates of .2 gal/pig/hr and .4 gal/pig/hr were compared. All wetting treatments significantly ($P<.01$) improved average daily gain and feed intake ($P<.05$) compared with non-wetted control. No differences were observed in feed to gain ratio among treatments. Drip sprinkling at the higher flow rate resulted in performance equal to that with intermittent spray cooling at both flow rates.

Introduction

Drip sprinkling is a simple, low cost means of increasing evaporative heat loss in swine. Previous studies have shown an improvement in feed intake, a decline in respiration rate, and a significant increase in litter weaning weight when sows were drip sprinkled during lactation. Although widely used in the farrowing phase, drip sprinkling has had very little use for cooling of finishing swine. This study was designed to compare drip and spray cooling at flow rates of .2 gallon/pig/hr and .4 gal/pig/hr with non-wetted controls.

Procedures

One hundred fifty pigs averaging 122 lb were assigned to one of five cooling treatments. Treatments were: 1) control or no wetting; 2) spray cooling @ .2 gal/pig/hr; 3) spray cooling @ .4 gal/pig hr; 4) drip sprinkling @ .2 gal/pig/hr; or 5) drip cooling @ .4 gal/pig/hr.

Pigs were housed in an open-front, partially slotted floor facility with 10 pigs per pen. Pens measured 6' by 20'. For spray cooled pens, one nozzle per pen was suspended over the slotted area approximately 6 ft above the floor. In drip cooled pens, emitters were suspended above the solid area. Each emmitter produced a flow rate of 1 gallon per hour. Either two emitters (.2 gal/pig/hr) or four emitters .4 gal/pig/hr) were provided per pen.

All pigs were fed a 16% sorghum-soybean meal diet. Pigs were weighed biweekly and feed intake and feed efficiency were determined. Feed and water were provided ad libitum.

Wetting systems were controlled thermostatically and operated when building temperature exceeded 85 F. Above 85 F, drip sprinklers operated continuously. Spray coolers operated intermittently (1 minute on, 14 minutes off)

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whenever ambient temperature exceeded 85 F. A time clock was attached to the control mechanisms for all cooling systems to provide a measure of the total time operated daily.

Results and Discussion

Results of this study are summarized in Table 2. All cooling systems increased average daily gain ($P<.01$) and average daily feed intake in all periods and for the overall trial when compared to control. No differences in feed to gain ratio were observed among treatments.

During the initial 14 days of the study, spray cooling @ .4 gal/pig/hr and both drip cooling treatments significantly improved average daily gain ($P<.01$) and feed intake ($P<.05$). The average high temperature for this period was 93.7 F and the average low was 75.3 F. Cooling systems operated approximately 10 hr each day.

During period two (Days 14-28), no differences were observed between treatments. Since the average high was 89.4 F, cooling systems did not operate most days during this period.

The third period of the trial was analyzed and non-wetted controls gained significantly slower ($P<.01$) than pigs in the wetted treatments. Pigs spray cooled at .2 gal/pig/hr tended ($P=.08$) to gain slower than either those spray-cooled at .4 gal/pig/hr or in either drip-cooled treatment. During this period, the wetting systems operated approximately 9.5 hr each day. No differences were observed in either daily gain or feed to gain ratio.

The feeding period for days 42 to 56 of the study was characterized by high temperatures and high relative humidity. In addition, as the pigs increase in size, their susceptibility to heat stress also increases. All cooling methods significantly improved ($P<.01$) feed intake and daily gain compared to controls. Among wetting treatments, drip sprinkling at a flow rate of .2 gal/pig/hr resulted in the lowest daily gain ($P<.01$). As in all previous periods, no differences were observed in feed to gain ratio.

During the final 14 days of the study, differences among treatments were small. This period was cooler than the previous 2 wk, and the control system activation temperature was not reached on most days.

The data for the entire 70-day study are summarized at the bottom of Table 2. All cooling systems significantly increased average daily gain ($P<.01$) and feed intake ($P<.05$) compared with non-wetted control. Pigs that were drip sprinkled at the .2 gal/pig/hr rate gained significantly slower than those in either wetting treatment at the .4 gal/pig/hr flow rate.

The pig has limited ability to lose heat by sweating. By wetting the pig with either intermittent sprinkling or continuous drip sprinkling, performance can be improved.

Table 1. Average High and Low Building Temperature During Trial

Day of Trial	Average High F	Average Low F
0-14	93.7	75.3
14-28	89.4	72.4
28-42	88.5	74.8
42-56	100.1	79.4
56-70	94.8	74.8
0-70	93.3	75.4

Table 2. Effect of Cooling Method and Flow Rate on Performance

	Treatments, flow rate gal/pig/hr				
Period	Control	Spray .2	Spray .4	Drip .2	Drip .4
Day 1-14					
ADG, lbs	1.63^{a}	1.66^{a}	1.90^{b}	1.85^{b}	1.87^{b}
ADFI, lbs	4.71^{d}	5.40^{de}	6.04^{e}	5.59^{e}	5.66^{e}
F/G	2.94	3.26	3.18	3.02	3.01
Day 15-28					
ADG, lbs	1.62	1.71	1.87	1.71	1.76
ADF, lbs	6.07	6.13	6.76	6.33	6.52
F/G	3.77	3.59	3.64	3.77	3.72
Day 29-42					
ADG, lbs	1.36^{a}	1.51^{b}	1.62^{bc}	1.69^{c}	1.61^{bc}
ADF, lbs	6.03	6.46	7.05	6.55	6.78
F/G	4.47	4.34	4.34	3.88	4.23
Day 43-56					
ADG, lb	1.25^{a}	1.87^{c}	1.99^{c}	1.66^{b}	1.94^{c}
ADF, lbs	5.27^{a}	7.02^{b}	7.87^{c}	6.53^{b}	7.05^{b}
F/G	4.52	3.80	3.96	3.98	3.64
Day 57-70					
ADG, lbs	1.64	1.88	1.63	1.26	1.54
ADF, lbs	5.92	6.67	6.70	6.07	6.27
F/G	3.83	3.55	4.23	4.77	4.08
Day 1-70					
ADG, lbs	1.50^{a}	1.73^{bc}	1.80^{c}	1.64^{b}	1.74^{c}
ADF, lbs	5.56^{d}	6.34^{e}	6.82^{e}	6.21^{e}	6.46^{c}
F/G	3.74	3.67	3.79	3.79	3.69

^{abc}Means with unlike superscripts differ (P<.01).
^{de}Means with unlike superscripts differ (P<.05).
ADG = average daily gain, ADF = average daily feed consumed, F/G = feed to gain ratio