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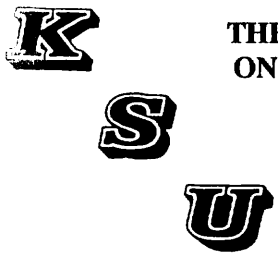

THE EFFECT OF SUPPLEMENTAL FAT AND LYSINE ON FINISHING PIG PERFORMANCE AND CARCASS CHARACTERISTICS

K. G. Friesen, R. D. Goodband, R.C. Thaler,[1] and J.L. Nelssen

Summary

One hundred and sixty pigs averaging 127.4 lb were used to determine the benefit of 5% supplemental fat and (or) .20% lysine on growth performance and carcass characteristics. The trial consisted of four treatments: 1) a .61%, lysine milo-soybean meal control diet; 2) control + 5% fat; 3) control + .20% lysine; 4) control + 5% fat and .20% lysine. Lysine:metabolizable energy ratios were held constant at 1.91:1 for treatments 1 and 2 and at 2.52:1 for treatments 3 and 4. Pig weights and feed consumption were recorded every third wk to calculate average daily gain (ADG), average daily feed intake (ADFI), and feed/gain (F/G). At the termination of the experiment, pigs were scanned via ultrasound for 10th rib backfat thickness (BF) and loineye area (LEA). High and low ambient temperatures were monitored to evaluate growth performance relative to temperature. Improvements in feed efficiency were detected when supplemental fat was added to the diet from d 0 to 21. During this period, the average temperature fluctuated from a low of 67.4°F to a high of 93.4°F. This period was the hottest of the experiment, with a mean temperature of 80.4°F for 16 d. Average daily gain increased 5 to 8% with supplements of fat or the combination of both fat and lysine to the diet. From d 21 to 42, no differences in performance were detected for diets supplemented with fat and(or) lysine. Overall, supplemental fat tended to improve feed efficiency by 8 to 14% in control and lysine-supplemented diets, respectively. Differences in ADG and ADFI were not detected over the entire trial. Supplemental fat increased BF and tended to reduce LEA. Supplemental lysine increased LEA with no effect on BF. These data suggest that supplemental fat and (or) lysine can be beneficial during periods of temperature above 90°F. Once temperatures subsided, a benefit to supplementing lysine in combination with fat was not detected.

(Key Words: Performance, Fat, Lysine, G-F.)

Introduction

Pigs in the growing-finishing stage obtain maximum performance at their thermal neutral zone of 55-85°F. In this temperature range, body maintenance requirements are at their lowest levels. At temperatures below this zone, the pig requires increased energy intake for body maintenance. Thus, increased feed intakes are detected in conjunction with poorer feed efficiency as a result of the body's need to maintain heat production. Conversely, temperatures above the thermal neutral zone depress feed intake. The pig consumes less feed during periods of high temperatures, which decreases the heat dissipated throughout the body from nutrient metabolism; however, the pig retains a high maintenance requirement through increased efforts to dissipate heat. Decreased growth rates are typical during periods of high temperatures because of the decrease in feed intake. A solution to this decreased performance is to supplement diets with fat and (or) lysine during the summer months. Adding fat and(or) lysine to the diet does not increase intakes but increases nutrient density of the

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diet. The pig does not consume more feed, but the feed that is consumed contains higher energy and amino acid concentrations for growth. Thus, the objective of this study was to evaluate the effect of supplemental fat and(or) lysine to finishing diets. Subsequential carcass characteristics were also obtained to determine treatment effects upon carcass merit.

Procedures

A total of 160 crossbred pigs averaging 127.4 lb were utilized to determine the effects of supplemental fat and lysine to finishing diets. The trial consisted of four dietary treatments: 1) a .61% lysine, milo-soybean meal control; 2) control + 5% fat; 3) control + .20% lysine; and 4) control + 5% fat and .20% lysine. Experimental diets were formulated to contain .66% calcium and .55% phosphorus (Table 1). A constant lysine: calorie ratio (grams lysine per Mcal energy) was maintained between treatments 1 and 2 (1.91:1) and between treatments 3 and 4 (2.52:1). By maintaining equal lysine:energy ratios, the response to added fat could be determined without lysine limiting performance. Pigs were blocked by weight and by sex into four blocks of four replicate pens. Each pen contained 10 pigs. Pigs were housed in a modified open-front building. Pens had 50% slatted floor and 50% solid floor. Each pen contained a self-feeder and a nipple waterer, providing feed and water ad libitum. Drip coolers were utilized during the experiment and cycled on for a period of 3 min out of 15 min when temperatures exceeded 85°F.

Pig weights and feed consumption were collected every third wk of the trial. Pigs were removed from the trial when the average weight of all pigs in a pen was 230 lb. Average daily gain (ADG), ADFI, and F/G were calculated at each weigh period. High and low temperature readings were taken each day to assess thermal environment effects on growth performance. At the termination of the trial, BF and LEA were measured ultrasonically (Technicare 210DX, Johnson and Johnson Co.).

Results and Discussion

Average daily gain and ADFI were not affected by supplemental fat and(or) lysine during the first 21 d of the trial. However, an improvement in F/G ($P < .05$) was detected for pigs fed the diets containing 5% supplemental fat (Table 2). Numerical improvements of 5 to 8% were detected in ADG with additions of fat to either the control diet or the diet + .20% lysine. Pigs fed diets containing .20% added lysine tended to have a 7 and 8% improvement in ADG. The average high temperature during this period was 94°F (Figure 1). The high temperatures resulted in decreased feed intake during the first 21 d of the trial compared to the second 21 d period. Decreased intakes during d 0 to 21 would correlate to temperatures above the maximum temperature of the thermal neutral zone. After d 21, average high temperatures were 80-85°F (Figure 1), at which the pig is within the thermal neutral zone. Growth performance was not altered by supplementing fat and lysine to the diets from d 21 to 42, though tendencies for increases up to 12% in ADG were detected for pigs fed the combination of supplemental fat and lysine. Feed efficiency tended to be improved by supplements of either fat or lysine during this period. In the overall trial, F/G tended to improve with 5% supplemental fat ($P < .10$) to either the control diet or the control + .20% lysine diet. Average daily gain was similar across treatments, with a slight numerical increase when the diet was supplemented with both fat and lysine.

These data show that the thermal environment plays a role in finishing pig performance. Though significant differences were not detected in ADG with supplemental fat and lysine, improvements in F/G were detected ($P < .05$). As average temperatures decreased after d 21 of the trial, treatment differences were less evident. This suggests that pigs do

not require addition energy and lysine during periods of ambient temperature within the thermal neutral zone.

Carcass quality was altered by supplements of fat and lysine to the control diet (Table 2). Backfat thickness was improved ($P < .10$) when fat was supplemented to the diets. Lysine supplementation did not have an effect upon BF thickness. Loineye area was increased ($P < .05$) by diets supplemented with lysine; however, decreases in LEA ($P < .10$) were detected with supplemental fat. These data indicated that though supplemental fat improves F/G, increases in BF and decreases in LEA result as a consequence. Additional lysine increases LEA by providing more amino acid available for lean growth.

Table 1. Composition of Diets

Ingredient, %	Control	Control + 5% Fat	Control + .2% Lysine	Control + 5% Fat + .2% Lysine
Sorghum	88.73	76.96	77.00	69.90
Soybean meal, 48%	13.33	15.09	20.20	22.31
Soybean oil		5.00		5.00
Monocalcium phosphate	1.09	1.13	0.97	1.00
Limestone	0.95	0.92	0.93	0.89
Salt	0.25	0.25	0.25	0.25
Vitamin premix	0.25	0.25	0.25	0.25
Trace mineral premix	0.10	0.10	0.10	0.10
Selenium premix	0.05	0.05	0.05	0.05
Antibiotic[a]	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00
Calculated Analysis				
Lysine, %	0.61	0.65	0.81	0.86
Metabolizable energy, Kcal/lb	1,451	1,541	1,456	1,548
Lysine:Energy, g/Mcal	1.91	1.91	2.52	2.52
Ca, %	.66	.66	.66	.66
P, %	.55	.55	.55	.55

[a]Chlortetracycline.

Table 2. Growth Performance and Carcass Traits for Pigs Fed Diets Containing Supplemental Fat and(or) Lysine

Item	Control	Control + 5% Fat	Control + .2% Lysine	Control + 5% Fat + .2% Lysine	CV
d 0 to 21					
ADG, lb	1.50	1.57	1.61	1.74	11.9
ADFI, lb	6.29	5.42	6.16	6.28	10.4
F/G[a]	4.25	3.46	3.84	3.63	11.5
d 21 to 42					
ADG, lb	1.77	1.65	1.70	1.87	11.6
ADFI, lb	6.57	5.97	6.50	6.41	8.8
F/G	3.74	3.63	3.86	3.46	11.6
d 0 to 63					
ADG, lb	1.78	1.75	1.71	1.88	9.0
ADFI, lb	6.43	5.87	6.49	6.32	7.3
F/G[c]	3.63	3.37	3.84	3.36	11.7
10th rib BF, in[cd]	0.79	0.89	0.80	0.89	22.2
LEA, in[bcd]	4.73	4.56	4.90	4.78	10.2

[a]Fat effect ($P < .05$).
[b]Lysine effect ($P < .05$).
[c]Fat effect ($P < .10$).
[d]NPPC equations utilized to adjust measurements based upon 230 lb live weight.

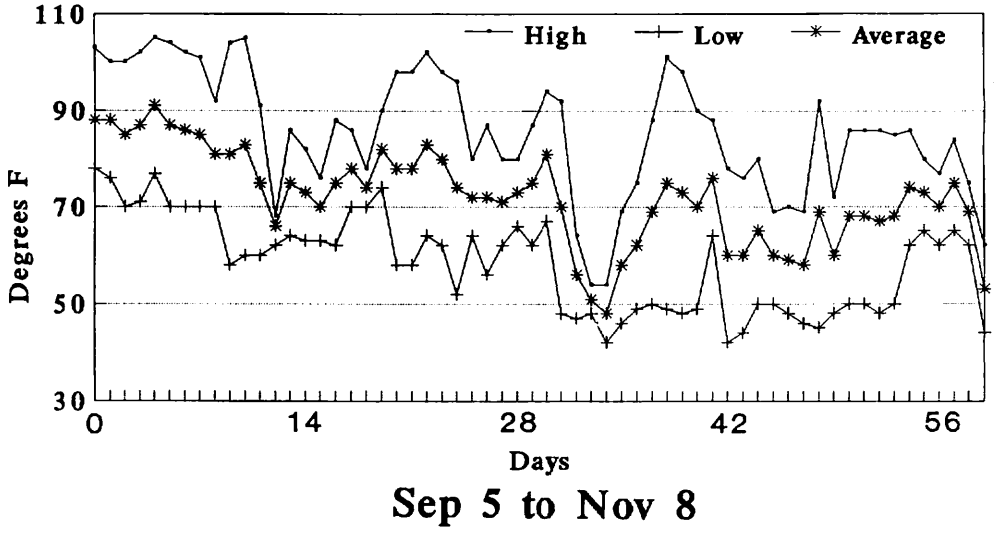

Figure 1. High, Low, and Average Temperatures for the Trial.