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I H. Kim

J H. Lee

J S. Park

See next page for additional authors

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Authors

I H. Kim, J H. Lee, J S. Park, Donald H. Kropf, S L. Johnston, P Sorrell, Robert H. Hines, and Joe D. Hancock

REMOVING VITAMIN AND TRACE MINERAL PREMIXES FROM FINISHER DIETS (154 TO 247 LB) DID NOT AFFECT GROWTH PERFORMANCE, CARCASS CHARACTERISTICS, OR MEAT QUALITY

I. H. Kim, J. D. Hancock, J. H. Lee, J. S. Park, D. H. Kropf, S. L. Johnston, P. Sorrell, and R. H. Hines

Summary

Average daily gain; ADFI; F/G; dressing percentage; tenth rib fat thickness and depth; and color, firmness, and marbling of the longissimus muscle were not influenced by omitting the vitamin and(or) trace mineral premixes from diets during finishing (154 to 247 lb). Thus, omitting vitamin and trace mineral premixes can decrease diet costs without decreasing performance or meat quality of high-lean pigs.

(Key Words: Finishing Pigs, Vitamins, Minerals, Meat Quality, Growth.)

Introduction

Feed represents 60 to 70% of the total cost of producing a market hog. Although vitamin and trace mineral premixes make up only a small part of the total feed, their withdrawal from diets for the finishing period will reduce production costs significantly.

In last year's KSU Swine Day Report, we suggested that the KSU vitamin and trace mineral premixes could be omitted during late finishing (200 to 250 lb) to reduce cost of gain without decreasing growth performance, carcass merit, or muscle quality. Therefore, the objective of the experiment reported herein was to determine if longer-term (150 to 250 lb) deletion of vitamin and(or) trace mineral premixes affects growth performance, carcass leanness, or muscle quality in finishing pigs.

Procedures

A total of 80 finishing barrows (initial wt of 154 lb) was blocked by weight and allocated to pens based on ancestry. Each treatment had two pigs (PIC Line 326 boars × C15 sows) per pen and 10 pens. Treatments were: 1) corn-soybean meal-based control with KSU vitamin and trace mineral premixes; 2) diet 1 with the vitamin premix omitted; 3) diet 1 with the trace mineral premix omitted; and 4) diet 1 with the vitamin and trace mineral premixes omitted. The diets were formulated to .7% lysine, .65% Ca, and .55% P (Table 1). The pigs were housed in an environmentally controlled finishing barn with 4 ft × 4 ft pens and totally slatted floors. The pens were equipped with a single-hole feeder and nipple waterer to allow ad libitum consumption of feed and water. Drip coolers were activated when temperatures exceeded 80°F. Pigs and feeders were weighed at the initiation and conclusion of the growth assay to allow calculation of ADG, ADFI, and F/G.

When the pigs in the heaviest pen of a weight block reached an average of 250 lb, the entire block was slaughtered. Two blocks reached the ending weight on d 40 and two blocks on d 49 of the experiment. The pigs were killed at a commercial slaughtered plant to collect carcass measurements. Tenth rib fat thickness was measured 2 in. off-midline using a Fat-O-Meter™ probe and adjusted to skin-on fat thickness by adding .1 to the probe reading. Dressing percentage was calculated with hot carcass weight as a percentage of slaughter weight. Color, firmness, and marbling of the longissimus muscle were determined according to NPPC (1991) guidelines. Additionally, chops from the 10th rib location were cut 1 in. thick, placed on an absorbent pad in a styrofoam tray, and overwrapped with polyvinylchloride film. Measurements of longissimus muscle color were determined at d 0 (before display) and after 3, 5, 10, and 15 d of continuous (24 h/d) display at 36°F under 150 foot candle deluxe, warm-white, fluorescent lighting. A Minolta spectrocolorimeter was used to measure meat lightness at d 0, 3, 5, 10, and 15. Water-holding capacity of the longissimus muscle was determined using the Carver press method. Thaw loss was determined as loss in weight after thawing the longissimus muscle at 2°F for 24 hr. The chops were cooked to an internal temperatures of 160°F. Warner-Bratzler shear force was determined using an Instron instrument.

Data were analyzed as a randomized complete block design with orthogonal contrasts used to separate treatment means. Hot carcass weight, dressing percentage, last rib backfat thickness, and longissimus muscle depth were analyzed with slaughter weight as a covariable. Pen was the experimental unit for all analyses.

Results and Discussion

From 154 to 247 lb, ADG, ADFI, and F/G were not influenced ($P > .15$) by dietary treatment. Dressing percentage; 10th rib fat thickness; fat free lean index; muscle depth; and subjective scores for color, firmness, and marbling of the longissimus muscle also were not affected by dietary treatment ($P > .11$).

Objective color determinations (Minolta spectrocolorimeter) at d 0 (before display) and d 5 suggested that pigs fed the diet without vitamins had lighter muscle than pigs fed the diet without the trace minerals ($P < .05$), but color for all treatments was considered well within normal ranges. Also, the rate of change for meat color at d 3, 5, 10, and 15 was similar for all treatments. Thus, withdrawal of the vitamin and(or) trace mineral premixes had no effect on pork muscle color stability during display.

Water-holding capacity was not affected by dietary treatment ($P > .38$), but pigs fed the diet without vitamins had lower Warner-Bratzler shear force than pigs fed the diet without trace minerals ($P < .02$). Thaw loss was not affected by dietary treatment ($P > .48$), and cooking loss for pigs fed the control diet actually was increased compared to pigs fed diets without the vitamin and(or) trace mineral premixes ($P < .01$).

In conclusion, additional research is needed to determine the effects of omitting the vitamin and (or) trace mineral premixes during the finishing phase on such response criteria as immune function and nutrient content of pork tissue. However, for the time being, cost of gain can be decreased by omitting these premixes during the finishing phase (154 to 247 lb). Also, omitting these premixes did not result in fat carcasses with poor meat color/quality, and the differences that were observed for the criteria measured were small and inconsistent.

Table 1. Diet Composition, %[a]

		Premix Omitted		
Ingredient, %	Control	Vitamin	Mineral	Vitamin & Mineral
Corn	83.82	83.99	83.93	84.10
Soybean meal (46.5% CP)	12.37	12.35	12.36	12.34
Soybean oil	1.00	1.00	1.00	1.00
Monocalcium phosphate (21% P)	1.12	1.12	1.12	1.12
Limestone	.94	.94	.94	.94
Salt	.30	.30	.30	.30
Vitamin premix	.15	--	.15	--
Trace mineral premix	.10	.10	--	--
Lysine-HCl	.15	.15	.15	.15
Antibiotic[b]	.05	.05	.05	.05

[a]All diets were formulated to .70% lysine, .65% Ca, and .55% P.
[b]Supplied 40 g/ton tylosin.

Table 2. Effects of Omitting Vitamin and Trace Mineral Premixes on Growth Performance in Finishing Pigs[a]

		Premix Omitted				Contrasts[b]		
Item	Control	Vitamin	Mineral	Vitamin & Mineral	CV	1	2	3
154 to 247 lb								
ADG, lb	2.10	2.11	2.07	2.16	7.1	1.00	.49	.41
ADFI, lb	6.89	6.95	6.49	6.87	9.3	.45	.35	.57
F/G	3.28	3.29	3.14	3.18	8.8	.43	.14	.97

[a]A total of 80 pigs (two pigs/pen and 10 pens/treatment) with an avg initial wt of 154 lb and an avg final wt of 247 lb.

[b]Contrasts were: 1) control vs other treatments; 2) omitting vitamins vs minerals; and 3) omitting vitamins or minerals vs omitting both.

Table 3. Effects of Omitting Vitamin and Trace Mineral Premixes on Carcass Characteristics and Meat Quality in Finishing Pigs[a]

		Premix Omitted				Contrasts[b]		
Item	Control	Vitamin	Mineral	Vitamin & Mineral	CV	1	2	3
Dressing percentage	73.9	74.8	73.7	72.4	3.9	.80	.40	.11
10th rib fat thickness, in.	.88	.94	.90	1.03	22.2	.35	.71	.21
Fat free lean index, %[c]	49.22	48.81	49.03	48.75	2.3	.41	.67	.70
Muscle depth, in	2.19	2.15	2.18	2.16	8.5	.79	.78	.96
Longissimus muscle area, in.	6.0	6.3	6.5	6.4	11.3	.15	.57	.84
Longissimus muscle color[d]	2.5	2.6	2.6	2.5	.1	.66	.72	.53
Longissimus muscle firmness[e]	2.5	2.6	2.5	2.6	.1	.35	.45	1.00
Longissimus muscle marbling[f]	2.2	2.1	2.4	2.0	.1	.63	.25	.12
Longissimus muscle lightness[g]								
0 d of display	54.9	55.1	53.4	54.1	.6	.28	.05	.90
3 d of display	55.3	55.1	53.3	53.6	.8	.18	.11	.49
5 d of display	55.7	56.2	54.0	55.0	.7	.41	.03	.86
10 d of display	55.9	56.4	54.4	55.3	.9	.58	.12	.96
15 d of display	55.3	55.8	53.7	55.0	1.0	.70	.15	.87
Water-holding capacity[h]	.45	.47	.47	.46	15.2	.38	.97	.68
Cooked meat tenderness[i]	6.4	5.7	7.1	6.0	18.9	.59	.02	.26
Thaw loss, %	1.3	1.3	1.1	1.4	44.3	.66	.67	.48
Cooking loss, %	27.7	25.0	24.6	22.9	14.4	.01	.83	.18

[a]A total of 80 pigs (two pigs/pen and 10 pens/treatment) with an average initial weight of 154 lb and an avg final wt of 247 lb.

[b]Contrasts were: 1) control vs other treatments; 2) omitting vitamins vs minerals; and 3) omitting vitamins or minerals vs omitting both.

[c]Equation (NPPC, 1991) was: fat free lean index = 51.537 + (.035 × hot carcass wt) - (12.26 × off-midline backfat thickness).

[d]Scored on a scale of 1 = pale pinkish-gray to 5 = dark purplish-red (NPPC, 1991).

[e]Scored on a scale of 1 = very soft and watery to 5 = very firm and dry (NPPC, 1991).

[f]Scored on a scale of 1 = practically devoid to 5 = moderately abundant (NPPC, 1991).

[g]Minolta CR-200 spectrocolorimeter values (lightness is Hunter L value).

[h]Expressed as a ratio of meat film area to total area (i.e., muscle/(fluid + muscle area)); a smaller value represented greater water-holding capacity.

[i]Instron™ shear force value, lb.