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D. B. Hudman

Nebraska Agricultural Experiment Station

E. R. Peo, Jr.

University of Nebraska-Lincoln

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CARCASS CHARACTERISTICS OF SWINE AS INFLUENCED BY LEVELS OF PROTEIN FED ON PASTURE AND IN DRY LOT¹

D. B. HUDMAN AND E. R. PEO, JR.

*Nebraska Agricultural Experiment Station, Lincoln*²

SEVERAL experiments have been conducted to compare the performance of growing-finishing swine fed on pasture and in dry lot. Most of the early experimental research was conducted with rations that were lacking in vitamin and antibiotic supplementation. In these experiments the pigs fed on pasture tended to gain faster and more efficiently than those fed in dry lot. However, more recent research conducted by Hutchinson *et al.* (1955, 1956), Conrad and Beeson (1957) and Barnhart, Overfield and Lowry (1959) indicates that with supplemental vitamins and antibiotics, pigs fed in dry lot gained slightly faster than pigs fed on pasture.

Terrill (1954) indicated that the amount of protein needed for growing-finishing swine fed on good quality pasture was 2% less than for those fed in dry lot.

The experiment reported herein was conducted to compare the effect of well fortified corn-soybean oil meal rations containing 12% and 14% protein on carcass characteristics of swine fed on pasture or in dry lot.

Experimental Procedure

One hundred-sixty purebred Yorkshire, Hampshire, Duroc and cross-bred Yorkshire-Hampshire pigs were randomly allotted by weight outcome groups and breeding to five replications of four experimental treatments of eight pigs per pen. This experiment was designed as a 2x2 factorial with two rations calculated to contain 12% and 14% protein fed to growing-finishing pigs on pasture or in dry lot.

The pigs fed on pasture were confined to a pen of approximately 0.5 acre of good alfalfa pasture. A portable wooden house, 8' x 12', with a wooden floor was used for shelter and shade in each pen. The dry lot pigs were housed in a brick building with an opening to a concrete apron on the outside of the building. These pens were cleaned daily. Both groups of pigs were provided with automatic waterers and self-feeders. All pigs and feeders were weighed at two-week intervals. The feed conversion (feed per pound of gain) and average daily gain were calculated for 70 days

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(June 19 through August 28). The lighter pigs were continued on their respective rations until they reached market weight.

Ten crossbred barrows were selected at random from each experimental treatment for slaughter. The gilts from this experiment were kept as breeding stock. The dressing percentage, carcass length, carcass weight and backfat thickness were obtained from the carcasses. Average backfat thickness was calculated as an average of three measurements (first rib, seventh rib and last lumbar vertebra). An estimate of the percentage of fat and lean in the carcass was calculated from a core sample taken from the carcass immediately posterior to the last rib, one inch laterally and parallel to the split surface of the carcass as described by Lu *et al.* (1958).

The composition of the experimental rations are presented in table 1.

TABLE 1. PERCENTAGE COMPOSITION OF EXPERIMENTAL RATIONS

Ingredient	12% protein ration	14% protein ration
Ground yellow corn	86.1	80.9
44% solvent soybean oil meal	7.0	12.2
50% meat and bone scraps	2.5	2.5
17% dehydrated alfalfa meal	2.5	2.5
Ground limestone	0.6	0.6
Steamed bone meal	0.2	0.2
Salt (iodized)	0.5	0.5
Trace minerals (high zinc, swine)	0.1	0.1
Vitamin-antibiotic premix ^a	0.5	0.5

^a Contributed the following amounts of vitamins and antibiotics per lb. of complete ration: vitamin D₂, 90 I.U.; riboflavin, 1.0 mg.; niacin, 4.5 mg.; calcium pantothenate, 2.0 mg.; choline chloride, 105 mg.; vitamin B₁₂, 5.0 mcg.; and antibiotics, 5 mg.

Results and Discussion

A summary of the average daily gain and feed required per pound of gain is presented in table 2. All statements concerning statistical significance are made at a probability of 0.05 or less (Snedecor, 1956). The pigs fed a 14% protein ration in dry lot made a significantly greater average daily gain than the pigs fed on pasture, but not significantly greater than the pigs fed the 12% protein ration in dry lot. The average daily gain of both groups of pigs fed in dry lot (12% and 14% protein) was significantly greater than that of the pigs fed the 12% protein ration on pasture. Also, the average daily gain of the pigs fed in dry lot was significantly greater than the average daily gain (1.60 vs. 1.45) of those fed on pasture. The average feed required per pound of gain for pigs fed on pasture was significantly less than for the pigs fed in dry lot (3.04 vs. 3.29). There was no significant difference in the amount of feed required per pound of gain between protein levels within management systems. Lower average final weights and the consumption of alfalfa pasture may have contributed to the reduction in feed required per pound of gain for pigs fed on pasture.

The average daily gain and feed required per pound of gain for different protein levels across management systems were not significantly different. Also, there was no significant interaction between protein level and system of management indicating that pigs of this weight and age gained at a comparable rate and feed efficiency regardless of protein level within management systems. Therefore, with these well-fortified rations there was no evidence that pasture-fed pigs required a lower percentage of protein in their ration than dry lot fed pigs.

TABLE 2. RESPONSE OF GROWING-FINISHING SWINE FED 12 AND 14 PERCENT PROTEIN RATIONS ON PASTURE AND IN DRY LOT

Treatment	Dry lot		Pasture		Qs \bar{x} ^a
	12% Protein	14% Protein	12% Protein	14% Protein	
Pens per treatment, no.	5	5	5	5	
Pigs per pen, no.	8 ^b	8	8	8 ^b	
Av. initial wt., lb.	64.1	64.2	64.2	64.4	
Av. final wt., lb.	173.6	177.4	163.8	166.4	
Av. daily gain, lb.	1.58	1.62	1.42	1.48	0.14
Feed per lb. gain, lb.	3.33	3.24	3.02	3.05	0.24

Treatment	Dry lot	Pasture	12%	14%
			Protein	Protein
Pens per treatment, no.	10	10	10	10
Pigs per pen, no.	8 ^b	8 ^b	8 ^b	8 ^b
Av. initial wt., lb.	64.2	64.3	64.2	64.3
Av. final wt., lb.	175.5	165.1	168.6	171.9
Av. daily gain, lb.	1.60 ^c	1.45 ^c	1.50	1.55
Feed per lb. gain, lb.	3.29 ^c	3.04 ^c	3.18	3.15

^a Difference required between treatment means for significance at $P=0.05$ or less.

^b One pig was removed from one pen.

^c Difference between means significant at $P=0.05$ or less.

The carcass data are summarized in table 3. The average final slaughter weight per treatment varied from 194.4 to 199.9 lb. and the average cold carcass weight per treatment varied from 134.4 to 142.9 lb. The pigs fed in dry lot had a higher dressing percentage than the pigs fed on pasture (71.68% vs. 69.83%) and those fed the 14% protein ration had a slightly higher dressing percentage than those fed the 12% protein ration (71.25 vs. 70.26). These differences were not statistically significant, nor was the difference in average carcass length between experimental treatments.

Pigs fed the 12% protein ration on pasture produced the thinnest backfat and the highest average estimated percentage of lean but differences were not significant. There was very little difference in backfat thickness and average estimated percentage of fat and lean between the protein levels. This finding is in agreement with the results of Crampton and

TABLE 3. COMPARISON OF CARCASSES OF GROWING-FINISHING SWINE FED 12 AND 14 PERCENT PROTEIN RATIONS ON PASTURE AND IN DRY LOT

Treatment	Dry lot		Pasture	
	12% Protein	14% Protein	12% Protein	14% Protein
Barrows per treatment, no.	10	10	10	10
Av. slaughter weight, lb.	198.8	199.9	194.4	199.0
Av. carcass wt., lb.	140.7	145.1	135.6	139.1
Av. dressing %	70.8	72.6	69.8	69.9
Av. carcass length, in.	29.4	29.3	29.3	29.3
Av. backfat thickness, in.	1.70	1.72	1.60	1.69
Av. estimated fat, % ^a	45.82	45.47	44.72	45.14
Av. estimated lean, % ^a	39.60	39.87	40.72	40.13

Treatment	Dry lot	Pasture	12% Protein	14% Protein
Barrows per treatment, no.	20	20	20	20
Av. slaughter weight, lb.	199.4	196.7	196.6	199.4
Av. carcass wt., lb.	142.9	137.4	138.2	142.1
Av. dressing %	71.7	69.9	70.3	71.2
Av. carcass length, in.	29.4	29.3	29.3	29.3
Av. backfat thickness, in.	1.71	1.64	1.65	1.70
Av. estimated fat, % ^a	45.64	44.76	45.10	45.30
Av. estimated lean, % ^a	39.74	40.42	40.16	40.00

^a According to Lu *et al.* (1958).

Ashton (1946) and Ashton *et al.* (1955) who reported no significant difference in carcass quality of pigs consuming rations that varied only 2% in protein content. The pigs fed in dry lot seemed to be slightly fatter than the pasture-fed pigs as evidenced by a thicker backfat and a higher percentage of estimated fat in the carcass. These observations are in agreement with those of Whatley *et al.* (1959); however, they reported that a corresponding difference was not observed when the carcass backfat was measured on a sample of the pigs.

Summary

One hundred and sixty growing-finishing pigs were fed 12% and 14% protein rations on pasture and in dry lot. The pigs fed in dry lot made significantly greater gains and required significantly more feed per pound of gain than the pigs fed on pasture.

The level of protein did not significantly affect the average daily gain or feed conversion. The protein level x management system (pasture and dry lot) interaction was not statistically significant for rate of gain and feed conversion.

Ten barrows were randomly selected from each of the four experimental

treatments and slaughtered. Those fed on pasture had a slightly thinner backfat and less estimated carcass fat than those fed in dry lot. However, these differences were not statistically significant.

Level of protein did not significantly affect dressing percentage, carcass length, backfat thickness or estimated carcass lean or fat.

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