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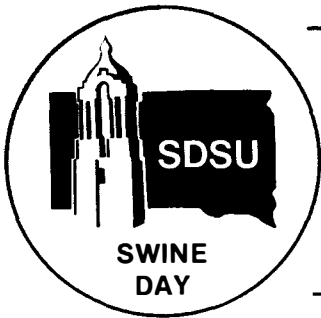
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PHOSPHORUS LEVELS IN DIETS OF GROWING-FINISHING SWINE

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Many swine diets are made up entirely of ingredients of plant origin and do not contain any animal products which are good sources of phosphorus. Plant products contain from one-half to two-thirds of their phosphorus in the phytate form which is poorly utilized by the pig. Estimates of availability of plant phosphorus range from 20 to 50%. The values given as requirements for phosphorus by the National Research Council are based on the assumption that the diet contains about .3% phosphorus from plant ingredients.

The objective of this experiment was to determine if phosphorus levels fed in starter diets affect the performance of growing-finishing pigs fed two levels of dietary phosphorus in growing and finishing diets.

Experimental Procedure

Ninety-six pigs averaging approximately 54 lb. were allotted on the basis of six previous starter dietary treatments (18 and 21% protein diets each containing .6, .8 and 1.0% phosphorus) to 24 pens of four pigs each for the growing-finishing period. Twelve pens were assigned to each of the dietary levels of .4 and .6% phosphorus. Composition of the diets is shown in table 1.

Pigs were housed in an enclosed confinement building in pens with totally slatted floors. At pen weights of approximately 210 lb., the barrows were slaughtered at the University Meat Laboratory. Carcass data obtained included carcass weight, tenth rib backfat, average backfat (average of first rib, last rib and last lumbar), loin eye area at tenth rib, carcass length and carcass lean. A metacarpal bone was removed from the front foot and dry weight and percent bone ash were determined on these bones.

Results

A summary of the growth and feed data for pigs fed diets containing .4 or .6% phosphorus is shown in table 2. There were small differences among average initial weights because of the method of allotment based on previous dietary treatments. However, daily gain, feed consumption and feed/gain were very similar and did not differ between pigs fed diets of .4 or .6% phosphorus. Dietary protein (18 or 21%) or phosphorus levels (.6, .8 or 1.0%) fed during the starter phase did not affect growth performance of pigs during the growing or finishing phases.

In table 3 are shown the results of the bone and carcass data of pigs fed the two levels of phosphorus during the growing-finishing period. There were no significant differences between treatments in any of the carcass measurements.

The percentage of bone ash in the metacarpal bone of the front foot was significantly ($P < .005$) higher for pigs fed diets containing .6% phosphorus. Apparently, the higher phosphorus level resulted in more mineral matter being deposited in the bones, although the growth rate was not affected by phosphorus level.

The effects of levels of dietary protein and phosphorus in starter diets on bone and carcass characteristics at market weight are shown in table 4. Average carcass backfat was significantly ($P < .05$) less for pigs fed the 21% protein starter diet than for pigs fed 18% protein starter diets. Loin eye area and carcass lean varied significantly among pigs fed starter diets of different phosphorus levels. Loin eye area increased as dietary phosphorus increased, while carcass lean was highest for pigs fed .8% phosphorus and was similar for pigs fed .6 and 1.0% dietary phosphorus in starter diets. There was a significant interaction between protein and phosphorus for carcass weight, tenth rib fat, average backfat and loin eye area with values for these decreasing as dietary protein increased from 18 to 21% and increasing as dietary phosphorus increased from .6 to 1.0%.

Metacarpal bone weights were heavier ($P < .05$) when pigs had been fed 21% protein starter diets than those fed 18% protein. Bone ash differed among phosphorus treatments with pigs fed .8% phosphorus in starter diets having the higher percentage of bone ash at market weight.

Summary

Ninety-six pigs, averaging about 54 lb. initially, that had been fed starter diets of 18 or 21% protein and .6, .8 or 1.0% phosphorus were fed growing-finishing diets with .4 or .6% phosphorus.

There were no significant differences between phosphorus treatments in rate of gain, feed consumption, feed/gain or carcass composition. Pigs fed diets of .6% phosphorus had a significantly higher percentage of bone ash. Average backfat was decreased and bone weight increased in pigs fed the higher protein starter diet and loin eye area and percent bone ash were affected by phosphorus level of the starter diet.

Table 1. Composition of Diets (Percent)

| Phosphorus, % | Growing | | Finishing | |
|---------------------|---------|------|-----------|------|
| | .4 | .6 | .4 | .6 |
| Corn | 77.9 | 77.3 | 83.5 | 82.9 |
| Soybean meal, 44% | 20.1 | 20.2 | 14.4 | 14.5 |
| Dicalcium phosphate | .3 | 1.4 | .4 | 1.5 |
| Limestone | 1.2 | .6 | 1.2 | .6 |
| Trace mineral salt | .3 | .3 | .3 | .3 |
| Premix ^a | .2 | .2 | .2 | .2 |

^a Supplied per lb. of diet: vitamin A, 1500 IU; vitamin D, 150 IU; vitamin E, 2.5 IU; vitamin K, 1 mg; riboflavin, 1.25 mg; pantothenic acid, 5 mg; niacin, 8 mg; choline, 25 mg; vitamin B₁₂, 5 mcg and aureomycin, 25 milligrams.

Table 2. Effect of Phosphorus in Growing-Finishing Swine Diets on Pig Performance

| | Phosphorus level, % | |
|--------------------------|---------------------|-------|
| | .40 | .60 |
| No. of pigs ^a | 47 | 47 |
| Avg initial wt., lb. | 50.5 | 57.1 |
| Avg final wt., lb. | 210.8 | 205.0 |
| Avg daily gain, lb. | 1.44 | 1.45 |
| Avg daily feed, lb. | 5.21 | 5.28 |
| Feed/lb. gain | 3.61 | 3.65 |

^a Twelve lots of four pigs each per treatment. One pig died in each treatment.

Table 3. Effect of Phosphorus in Growing-Finishing Swine Diets on Bone and Carcass Data

| | Phosphorus level, % | |
|------------------------------|---------------------|-------|
| | .40 | .60 |
| No. of pigs | 23 | 23 |
| Avg carcass wt., lb. | 160.5 | 157.4 |
| Avg tenth rib fat, in. | 1.01 | 1.05 |
| Avg backfat, in. | 1.18 | 1.17 |
| Loin eye area, sq. in. | 4.90 | 5.26 |
| Carcass length, in. | 30.85 | 30.91 |
| Carcass lean, % | 54.71 | 54.32 |
| Bone wt., grams ^a | 16.62 | 16.71 |
| Bone ash, % ^b | 59.38 | 59.90 |

^a Metacarpal, dry weight.

^b Significant difference (P<.005).

Table 4. Effect of Dietary Protein and Phosphorus in Starter Diets on Bone and Carcass Data at Market Weight

| | Protein level, % | | Phosphorus level, % | | |
|---------------------------------------|------------------|-------|---------------------|-------|-------|
| | 18 | 21 | .6 | .8 | 1.0 |
| No. of pigs | 23 | 23 | 15 | 16 | 15 |
| Avg carcass wt., lb. ^a | 159.6 | 158.4 | 156.9 | 157.5 | 162.5 |
| Avg tenth rib fat, in. ^a | 1.10 | .96 | 1.03 | .92 | 1.14 |
| Avg backfat, in. ^{a,b} | 1.24 | 1.11 | 1.15 | 1.15 | 1.23 |
| Loin eye area, sq. in. ^{a,c} | 5.21 | 4.95 | 4.60 | 5.24 | 5.40 |
| Carcass length, in. | 30.86 | 30.91 | 30.83 | 31.14 | 30.67 |
| Carcass lean, % ^c | 53.78 | 55.25 | 53.84 | 56.44 | 53.27 |
| Bone wt., grams ^{b,d} | 16.32 | 17.02 | 16.71 | 16.55 | 16.74 |
| Bone ash, % ^c | 59.49 | 59.81 | 59.42 | 59.93 | 59.59 |

^a Significant protein x phosphorus interaction (P<.05).

^b Significant protein effect (P<.05).

^c Significant phosphorus effect (P<.05).

^d Metacarpal, dry weight.