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Nutrient Analysis of South Dakota Swine Feeds

C. Ross Hamilton
South Dakota State University

NUTRIENT ANALYSIS OF SOUTH DAKOTA SWINE FEEDS[1]

C. Ross Hamilton

Department of Animal and Range Sciences

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Current economical conditions have forced swine producers to utilize available resources efficiently to reduce production cost. A major portion of the production cost in most swine enterprises may be attributed to obtaining, handling and processing feeds. Grains are utilized as a source of dietary energy and constitute a major portion of swine diets. Thus, the practice of evaluating all feed grains available in a given geographic area to determine the grains providing the most economical gains other than feeding only those grains raised by the individual producer is expected to increase. Producers must understand how grains differ in their nutritional and physical characteristics and have an appreciation for nutritional principles to utilize grains other than corn economically. The survey study reported herein was conducted to better understand the feed handling, mixing and nutritional practices used by South Dakota swine producers. From these results, more useful educational programs in swine nutrition management may be developed.

(Key Words: Feed Analysis, On-farm Mixing, Calcium, Phosphorus, Protein.)

Experimental Procedure

Survey forms were provided to field representatives for member firms of the Dakota Feed Manufacturers Association. A survey form accompanied each feed sample as it was submitted to the respective feed manufacturer for laboratory analysis. Information requested for each sample included ingredients used, growth stage of pigs to receive diet, type of mixing facilities, mixing time, if scales were used to weigh ingredients and target values for protein, calcium and phosphorus. Each laboratory was requested to provide the analyzed values for protein, calcium and phosphorus. Analyzed and target values for lysine were not requested because of the cost and variations in assay techniques used in the various labs involved in the study.

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[1] Appreciation is expressed to members of the Dakota Feed Manufacturers Association for their cooperation in obtaining and analyzing feed samples.

Data collected from the study were summarized to determine averages and ranges using analyzed values for the nutrients. Target and analyzed nutrient levels were correlated to estimate formulation accuracy.

Results

Twenty-four survey forms were returned in the study. While the data obtained is both useful and interesting, the small number of observations limits application of any conclusions for the swine industry in South Dakota.

Analyzed protein, calcium and phosphorus values were averaged within the appropriate swine production class. Those nutrient averages and ranges are summarized in table 1. Average protein levels were similar to current recommendations. It should be pointed out that protein levels for grower and finisher diets were about the same probably because of the large variation in protein levels for the grower diets. A portion of the variation observed for protein levels in all of the diets may be attributed to the different feed grains used. Barley, corn, wheat, oats and milo were used individually or in combination in the diets sampled. When properly formulated to supply the recommended level of lysine, the dietary protein content would be expected to vary as different grains are used. Thus, protein may not be an appropriate indicator of feed mixing practices except when a constant grain is used. Comparison between the target or expected protein level and the analyzed value produced a correlation coefficient of .69.

Average calcium levels for the finisher and sow diet samples approximated current recommendations. However, the average calcium levels for the grower (.90%) and starter (1.24%) diet samples exceeded current recommendations of .65% and .70%, respectively. Target and analyzed levels of calcium were not consistent (r=.52). Average phosphorus levels corresponded with recommended levels more closely except for the starter diet samples which averaged .82% compared to the .6% recommended. The relationship between target and actual phosphorus levels was similar to that observed for calcium (r=.53). Average calcium to phosphorus ratios for the finisher, grower, starter and sow diets were 1.36:1, 1.5:1, 1.51:1 and 1.43:1, respectively. The ratios were all within an acceptable range.

The range in calcium and phosphorus levels for the samples analyzed seemed extreme. Some diets apparently continued little or no supplemental calcium or phosphorus. Calcium levels in most traditional swine feeds are low and supplemental calcium is necessary to support normal growth and production. A large portion of the phosphorus content in grains and other plant products is not available to the pig. As a result, at least 30% of the pigs phosphorus requirement should be from an inorganic source. When diets are formulated on a least cost basis, maximum levels of calcium supplements may be added due to their low

Table 1. Nutrient Content of Producer Mixed Samples[a]

Production status	No. of samples	Crude protein, % average	Crude protein, % range	Calcium, % average	Calcium, % range	Phosphorus, % average	Phosphorus, % range
Finisher 120 to 220 lb	5	15.2±.58[b]	14.0-16.4	.79±.12	.48-1.05	.58±.09	.36-.79
Grower 40 to 120 lb	7	15.4±.92	12.3-19.3	.90±.2	.19-1.68	.60±.08	.32-.86
Starter 20 to 40 lb	6	17.6±.49	16.5-19.9	1.24±.16	.77-1.78	.82±.07	.63-1.03
Sows	7	14.3±.93	10.0-16.6	.99±.20	.25-1.53	.69±.09	.29- .97

[a] Nutrient analyses conducted by commercial analytical laboratories in the feed industry.

[b] Mean ± standard error for the number of observations indicated.

cost. However, phosphorus supplements are expensive and the minimum level of phosphorus supplementation may be expected. Most commercial feed manufacturers have sufficient quality control measures such that calcium and phosphorus levels stay within certain ranges. A more likely explanation for the extreme ranges observed in this study may be related to mixing practices. Failure to add supplements according to directions, adding extra amounts of some supplements or adding grains having a different density on a volume rather than weight basis may affect the nutrient content of the final mix. Further variation may be attributed to time that ingredients are allowed to mix. Mixing times varied from 5 to 30 minutes for portable and stationary vertical mixers. Inadequate mixing does not allow for proper ingredient distribution while excessive mixing results in segregation of certain ingredients. Samples collected from feeds that were inadequately mixed would be expected to have extremely low or high nutrient levels, depending upon the fraction sampled. Producers should follow the manufacturers guidelines for mixing time for their particular mixer.

About 50% of the samples obtained were mixed with portable mixers, while 33% used meter-type mills and 12% utilized vertical stationary mills. Scales were used to weigh ingredients for only 8% of the diets sampled. Considering the variation in grains that were used, differences in density of the grain could produce inaccurate formulations when ingredients are added by volume rather than by weight. Volumetric mixers and meter-type feed mills should be routinely calibrated to prevent mixing errors. A more in-depth study is needed to further investigate the sources of variation indicated here and to determine the appropriate educational program needed to increase producer awareness.

Summary

A survey was conducted utilizing feed samples submitted to feed manufacturers for nutrient analysis. Average protein levels for the 24 samples surveyed approximated current recommended levels. Calcium and phosphorus levels were extremely variable between samples and relative to current recommendations. Use of a wide variation of grains, infrequent use of scales to weigh ingredients and variable mixing times were suggested as sources of variation in the analyzed results.