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# Effect of Cooked Soybeans and Type of Housing on Growth Performance and Carcass Chracteristics of Swine

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# Effect of Cooked Soybeans and Type of Housing on Growth Performance and Carcass Characteristics of Swine

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Raw soybeans are an unsatisfactory source of protein for growing pigs because of the presence of a trypsin inhibitor. This inhibitor causes poor utilization of essential amino acids by the pig and subnormal growth results. This inhibitor present in raw soybeans is destroyed by heat in the processing of soybean meal or in cooking the raw beans to a temperature of at least 225° F. Development of equipment capable of rapid cooking of soybeans on the farm has increased the interest of many swine producers in the feeding of cooked soybeans.

Previous research conducted at the Southeast South Dakota Experiment Farm had shown very little difference in rate of gain of growing pigs housed in totally confined or in open-front buildings. However, approximately 9% less feed was required when pigs were housed in the confinement buildings. The present experiment was conducted to obtain further information on the effect of cooked soybeans in diets for growing pigs when housed in a controlled environment confinement building or an open-front building with waterers and feeders in an outside concrete lot.

## Experimental Procedure

Seventy-two crossbred pigs (40 barrows and 32 gilts) were randomly allotted to two replications of four treatments on the basis of litter, weight and sex. Average initial weights for replicates 1 and 2 were 93.4 and 58.6 lb., respectively.

The four treatments were:

1. Confinement building, soybean meal in diet.
2. Confinement building, cooked soybeans in diet.
3. Open-front building, soybean meal in diet.
4. Open-front building, cooked soybeans in diet.

The diets fed up to an average weight of 120 lb. contained 16% protein. Protein content was reduced to 13% in the diets fed during the finishing phase, 120 lb. to market weight. The composition of the diets is shown in table 1.

The totally confined house was a fully insulated, ventilated, slotted floor house. The temperature was maintained between approximately 50 and 60° F. The open-front house was a pole type building, open to the east, with concrete floor and outside concrete feeding floor. A partition, approximately three feet high, confined the pigs to a sleeping area at the rear of the house that was bedded with straw. The experiment was conducted during the winter months from December 8 to March 3.

Fifty-one pigs (39 barrows and 12 gilts) were slaughtered at the termination of the experiment and carcass data were obtained for carcass length, backfat, loin eye area and ham-loin percent. The gilts were not all slaughtered because some were retained for the breeding herd. One barrow failed to weigh 200 lb. at the termination of the experiment and was not included in the carcass data.

## Results

A summary of the results of this experiment is presented in table 2. Table 3 summarizes the data as to the effects of housing type or dietary treatment. The growth performance data are shown for each replicate since there was a large difference in initial starting weights between replicates. Rate of gain was not significantly different between replicates. However, the heavier pigs in replicate 1 did consume more daily feed and were less efficient in feed conversion than the lighter pigs of replicate 2. These differences are to be expected as heavier pigs have a greater maintenance requirement and require more feed to produce a unit of gain.

Pigs fed in confinement gained significantly faster than those housed in the open-front building (1.99 vs. 1.73 lb. per day). This is the first year that a difference of this magnitude has been observed. It was consistent as the four lots in the confined house had average gains of from 1.89 to 2.11 lb. per day while those lots in the open-front building gained from 1.67 to 1.78 lb. per day. Differences between this experiment and previous ones were heavier initial weights, later starting date and a colder than average January. It is possible that these factors may have had some effect on the growth of the pigs fed in this experiment.

Feed per gain was improved 8% when pigs were fed in the confined house. This is similar to the differences reported in previous experiments. However, actual feed required per pound of gain in this experiment was less in both housing types than in previous experiments. It is possible that the improved feed/gain ratio is a reflection of the faster gains observed in the present experiment. Type of housing had little effect on carcass characteristics. The 0.11 inch greater backfat present on carcasses of pigs fed in the confined building was probably a reflection of the faster rate of gain of these pigs.

The performance of pigs fed soybean meal or cooked soybeans as a protein source did not differ. All pigs gained at a very acceptable rate. The diet containing cooked soybeans should have had a higher energy content due to the fat content of soybeans. However, this higher energy content did not reflect itself in an improved feed/gain ratio. Previous work at this station had shown an improvement of about 6% in feed efficiency when cooked soybeans replaced soybean meal in the diet of growing pigs.

Carcass characteristics of pigs fed the two diets were very similar. There was a trend toward slightly greater backfat on carcasses from pigs fed the cooked soybean diet (1.39 vs. 1.30 inches). This difference would reflect the higher energy content of the cooked soybean diet.

Table 4 shows the value of properly cooked soybeans at various corn and soybean meal prices. To obtain a comparative value of raw soybeans the cost of processing (cooking and grinding) must be subtracted from the cooked value. For each dollar per ton processing cost, it is necessary to subtract 3 cents per bushel from the value of the cooked beans to obtain the value of raw beans. Therefore, if the cooking cost was $10 per ton, it would decrease the value of raw soybeans by 30 cents per bushel.

## Summary

Seventy-two crossbred pigs were used to study the effect of type of housing and cooked soybeans as a dietary protein source. In this experiment rate of gain and feed per gain were significantly improved when pigs were housed in a totally

confined house compared to open-front housing during the winter months. Growing-finishing pigs fed diets containing cooked soybeans or soybean meal had similar rates of gain and feed/gain ratios.

The faster gaining pigs in confinement had slightly more carcass backfat than those pigs housed in open-front buildings. The backfat of carcasses from pigs fed diets containing cooked soybeans was slightly greater than that of pigs fed soybean meal diets. There were no differences in other carcass characteristics between treatments.

Table 1. Composition of Diets (Percent)

| | To 120 lb. | | 120 to 210 lb. | |
|---|---|---|---|---|
| Diet | A-1 | B-1 | A-2 | B-2 |
| Ground yellow corn | 72.2 | 76.5 | 82.5 | 85.0 |
| Ground cooked soybeans | 25.0 | -- | 14.7 | -- |
| Soybean meal, 44% | -- | 20.7 | -- | 12.2 |
| Ground limestone | 0.55 | 0.55 | 0.9 | 0.9 |
| Dicalcium phosphate | 1.5 | 1.5 | 1.15 | 1.15 |
| Trace mineral salt | 0.5 | 0.5 | 0.5 | 0.5 |
| Vitamin-antibiotic[a] | 0.25 | 0.25 | 0.25 | 0.25 |

[a] Provided per lb. of diet: 1500 I.U. vitamin A, 150 I.U. vitamin D, 1 mg. riboflavin, 2.5 mg. calcium pantothenate, 7.5 mg. niacin, 50 mg. choline, 5 mcg. vitamin $B_{12}$ and 5 mg. oxytetracycline per pound of diet.

Table 2. Cooked Soybeans in Diets for Pigs Housed in Confinement or Open-Front Buildings

| | Confinement | | Open-front | |
|---|---|---|---|---|
| Diet | Soybean meal | Cooked soybeans | Soybean meal | Cooked soybeans |
| No. of pigs[a] | 18 | 18 | 18 | 18 |
| Avg. daily gain, lb. | | | | |
| Rep 1 | 1.93 | 1.89 | 1.72 | 1.67 |
| Rep 2 | 2.00 | 2.11 | 1.78 | 1.74 |
| Avg. feed consumed, lb. | | | | |
| Rep 1 | 6.32 | 6.29 | 5.92 | 5.92 |
| Rep 2 | 5.94 | 6.09 | 5.56 | 5.71 |
| Avg. feed/gain, lb. | | | | |
| Rep 1 | 3.27 | 3.33 | 3.47 | 3.54 |
| Rep 2 | 2.97 | 2.89 | 3.13 | 3.28 |
| Carcass data | | | | |
| No. of pigs | 13 | 13 | 12 | 13 |
| Avg. length, in. | 30.1 | 29.6 | 29.9 | 29.9 |
| Avg. backfat, in. | 1.35 | 1.44 | 1.24 | 1.34 |
| Avg. loin eye area, sq. in. | 4.59 | 4.86 | 5.21 | 4.79 |
| Avg. ham-loin, % | 39.22 | 39.07 | 39.78 | 39.32 |

[a] Two replicates of 9 pigs each per treatment. Avg. initial wt., 93.4 and 58.6 lb. for replicates 1 and 2, respectively. Avg. final weights approximately 210 lb.

Table 3. Effect of Housing and Diet on Swine Performance

| | Housing | | Diet | |
|---|---|---|---|---|
| | Confine-ment | Open-front | Soybean meal | Cooked soybeans |
| No of pigs[a] | 36 | 36 | 36 | 36 |
| Avg. daily gain, lb. | 1.99 | 1.73 | 1.86 | 1.85 |
| Avg. feed/gain, lb. | 3.09 | 3.34 | 3.19 | 3.23 |
| Carcass data | | | | |
| No. of pigs | 26 | 25 | 25 | 26 |
| Avg. length, in. | 29.9 | 29.9 | 30.0 | 29.8 |
| Avg. backfat, in. | 1.40 | 1.29 | 1.30 | 1.39 |
| Avg. loin eye area, sq. in. | 4.73 | 4.99 | 4.89 | 4.83 |
| Avg. ham-loin, % | 39.14 | 39.54 | 39.49 | 39.20 |

[a] Four lots of 9 pigs (5 barrows and 4 gilts) per treatment.

Table 4. Value of Cooked Soybeans (Dollars per Bushel)

| Price, Corn/Bushel | Price, 44% Soybean Meal/Ton | | | | | |
|---|---|---|---|---|---|---|
| | $70 | $80 | $90 | $100 | $110 | $120 |
| $1.00 | 2.13 | 2.35 | 2.58 | 2.80 | 3.03 | 3.25 |
| $1.10 | 2.18 | 2.41 | 2.63 | 2.86 | 3.08 | 3.31 |
| $1.20 | 2.24 | 2.46 | 2.69 | 2.91 | 3.14 | 3.36 |
| $1.30 | 2.29 | 2.52 | 2.74 | 2.97 | 3.19 | 3.42 |
| $1.40 | 2.35 | 2.57 | 2.80 | 3.02 | 3.25 | 3.47 |
| $1.50 | 2.40 | 2.63 | 2.85 | 3.08 | 3.30 | 3.53 |
| $1.60 | 2.46 | 2.68 | 2.91 | 3.13 | 3.36 | 3.58 |
| $1.70 | 2.51 | 2.74 | 2.96 | 3.19 | 3.41 | 3.64 |