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Performance and Carcass Traits of Pigs on Diets Containing Varying Amounts of Peanut Meal[1]

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ABSTRACT

For two feeding trials, weanling pigs were divided into five comparable groups of eight pigs per group. A group of pigs was assigned at random to each of the five diets in which the source of supplemental protein was: Diet 1, 100% soybean meal; Diet 2, 75% soybean meal and 25% peanut meal; Diet 3, 50% soybean meal and 50% peanut meal; Diet 4, 25% soybean meal and 75% peanut meal; Diet 5, 100% peanut meal. Pigs on Diets 1 and 2 gained weight faster than pigs on Diets 3 and 4 which in turn gained faster than pigs on Diet 5 ($P<.05$). Pigs on Diets 1 and 2 ate less feed and required less feed per unit of gain than pigs on Diets 3 and 4 which in turn consumed less feed and required less feed per unit of gain than pigs on Diet 5 ($P<.05$). Carcass length and backfat depth were similar ($P>.05$) for pigs on all diets. Area of the *Longissimus dorsi* muscle at the 10th rib (loin-eye area) was similar ($P>.05$) for pigs on Diets 1, 2 and 3 but was smaller in pigs on Diet 4 and a further decrease occurred in pigs on Diet 5 ($P<.05$). The weight of lean cuts for pigs on Diets 1, 2, 3 and 4 was similar ($P>.05$) but was less ($P<.05$) for pigs on Diet 5. Although tremendous increases in per acre yields of peanuts have been obtained in recent years, there has been no improvement in protein quality of peanut meal as measured by performance of growing-finishing pigs.

Key Words: Carcass traits, growning-finishing pigs, peanut meal, performance, soybean meal.

During recent years the nutritional and economic advantages of using plant proteins in diets for swine have become apparent. The meals of leguminous oilseeds peanuts (*Arachis hypogaea* L.) and soybeans [(*Glycine max* (L.) Merrill)] - are the most accepted plant proteins for swine feed. Peanut meal contains more niacin, pantothenic acid, riboflavin and thiamine but less lysine, methionine and tryptophan than soybean meal (5). Because soybean meal contains more of these three essential amino acids than peanut meal it is a better protein supplement for cereal grains used in swine diets. However, peanut meal may be used as a portion of the protein supplement for cereal grains when the price is competitive.

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It has been shown that corn-peanut meal diets, supplemented with synthetic lysine, produce weight gains in swine almost equal to those from corn-soybean meal diets (8, 9). Kornegay *et al.* (3) reported that the maximum amount of soybean meal that could be replaced by peanut meal for growing pigs appeared to be between 30 and 50 percent. Peanut meal used in these early feeding trials was produced primarily from the 'Dixie Runner', 'Early Runner,' and 'Starr Spanish' cultivars. Presently, the high yielding 'Florunner' cultivar is the predominant variety of peanuts grown in the Southeast and nearly all the peanut meal produced in this area comes from this new cultivar. Thus, this study was conducted to determine the effect of various proportions of peanut meal produced from a new variety of peanuts and soybean meal on growth rate, feed efficiency and carcass traits of growing-finishing swine.

Materials and Methods

For each of two trials, 40 weanling pigs (average 20.9 kg body weight) were divided into five comparable groups of eight pigs each based on weight and sex. A group of pigs was assigned at random to each of five diets in which the supplemental protein was composed of the following proportions of soybean meal and peanut meal: Diet 1, 100% soybean meal; Diet 2, 75% soybean meal and 25% peanut meal; Diet 3, 50% soybean meal and 50% peanut meal; Diet 4, 25% soybean meal and 75% peanut meal; Diet 5 100% peanut meal. Composition of diets is shown in Table 1. Proximate analysis of diets was conducted by methods of AOAC (1) except for nitrogen which was determined with a Techincon Autoanalyzer II (Industrial Method No. 329-74 W/A).

Crude protein (%N X 6.25) contents of the corn, soybean meal and peanut meal used in this experiment were 8.8, 50 and 54% respectively. Pigs were on the diets containing 16% crude protein until they attained body weights of about 50 kg and on the diets containing 13% crude protein thereafter.

We used the factor 6.25 in converting nitrogen of diets and dietary ingredients into crude protein because this factor is used by animal scientists in all feeding trials. However, factors of 5.71 for soybeans and 5.46 for peanuts have been recommended by Orr and Watt (4) for converting nitrogen into food protein.

The peanut meal used for trial 1 was obtained from a peanut meal processing plant located at Valdosta, Georgia, and that used for trial 2 was obtained from a peanut meal processing plant located at Graceville, Florida. Virtually all of the peanut meal produced at these two plants is made from the 'Florunner' cultivar.

The pigs were housed and fed individually in separate concrete floored pens (1.22 X 3.66 m) with feed and water supplied *ad libitum*. The pens were located under an open shed (eaves 2.1 m high) and oriented north and south in two

Table 1. Percent composition of diets fed pigs in both trials of the experiment[1]

	Diet Number									
	1		2		3		4		5	
Item	16[2]	13[2]	16	13	16	13	16	13	16	13
Ground corn	79.5	86.5	79.8	86.7	80.0	86.9	80.5	87.0	81.0	87.1
Dehulled soybean meal	18.0	11.0	13.5	8.0	9.1	5.5	4.5	3.0	-	-
Peanut meal	-	-	4.2	2.8	8.4	5.1	12.5	7.5	16.5	10.4
Mineral mixture[3]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Vitamin mixture[4]	.3	.3	.3	.3	.3	.3	.3	.3	.3	.3
Antibiotic mixture[5]	.2	.2	.2	.2	.2	.2	.2	.2	.2	.2
Proximate analysis										
Moisture	11.2	12.0	11.3	12.2	11.4	12.3	11.5	12.1	11.5	12.4
Crude protein (Nx6.25)[6]	16.0	13.1	16.1	13.2	16.1	13.0	16.2	13.2	16.2	12.9
Ether extract	4.0	2.9	4.1	2.8	3.7	3.1	3.4	3.2	3.0	3.0
Crude fiber	2.2	2.0	2.3	2.1	2.4	2.3	2.3	2.2	2.4	2.1
Ash	4.8	4.4	4.8	4.8	4.4	4.3	4.5	4.4	4.2	4.3
NFE	61.8	65.6	61.4	64.9	62.0	65.0	62.1	64.9	62.7	65.3

[1] Composition listed on an as-fed basis.

[2] Crude protein contents of diets were 16% for pigs from the beginning of the test until they attained mean body weights of about 50 kg and 13% crude protein thereafter.

[3] Percent composition of mineral mixture was: Phosphorus, 6.50, (minimum); Calcium, 22.0, (minimum)-25.0, (maximum); Salt, 23.0, (minimum)-26.0, (maximum); Iron, 1.00, (minimum); Zinc, .40, (minimum); Manganese, .20 (minimum); Copper, .10, (minimum); Cobalt, .01 (minimum); Iodine, .01, (minimum) and Flourine, .065, (maximum).

[4] Each kg of vitamin premix contained 1.50 g riboflavin; 4.5 g panthothenic acid; 6.5 g niacin; 65 g choline chloride; 10 mg vitamin B_{12}; 880,000 IU vitamin A; 88,000 IU vitamin D; and 1,000 IU vitamin E.

[5] The antibiotic mixture contained 22 g chlortetracycline per kilogram.

[6] Crude protein content of the ground corn, dehulled soybean meal and peanut meal was 8.8, 50 and 54%, respectively.

rows separated by 1.83 m alley so that two-thirds of each pen was under the roof.

Pigs were removed from test and slaughtered when the mean group weight was between 92.4 and 98.8 kilograms. Data obatined on chilled carcasses were length, backfat depth, area of the *Longissimus dorsi* muscle at the 10th rib (loin-eye area) and weight of lean cuts (trimmed hams, loins, and shoulders).

Data were analyzed by appropriate least squares analysis of variance and covariance. Significant differences among treatment means were determined by Duncan's new multiple range test (7).

Results and Discussion

Least square means for final weight, average daily gain, feed consumed and feed-to-gain ratio are listed in Table 2. Final weights of pigs on Diets 1, 2, 3, and 4 were similar but pigs on Diet 5 were removed from test at lighter weights ($P<.05$). Average daily gains of pigs were significantly influenced by the amount of peanut meal in the diet. Rates of weight gain of pigs were similar ($P>.05$) on Diets 1 and 2; however, they were reduced ($P<.05$) on Diets 3 and 4. A further reduction of nearly 15% in growth rate was obtained when the amount of supplemental protein from peanut meal was increased from 75 to 100 percent.

Means for feed consumed and feed required per unit of weight gain (feed:gain) for pigs on Diets 1 and 2 were similar ($P>.05$) but pigs on Diets 3 and 4 consumed more feed ($P<.05$) and required more feed per unit of gain ($P<.05$). A further increase in the amount of feed consumed and in feed:gain ($P<.05$) was obtaned for pigs on Diet 5.

Results indicate that 25% of the supplemental

Table 2. Adjusted least square means for performance and carcass traits of swine fed diets with varying amounts of peanut meal and soybean meal[1]

	Percent of supplemental protein from peanut meal					
	0	25	50	75	100	SE[2]
Final wt, kg	98.1[ab3]	97.6[ab]	98.8[a]	98.4[a]	92.4[c]	.77
Avg daily gain, kg	.88[a]	.87[a]	.83[b]	.82[b]	.72[c]	.01
Days on test	88	88	94	95	99	
Feed consumed, kg	234.2[a]	229.9[a]	247.4[b]	250.0[bc]	270.0[d]	3.08
Feed:gain	3.00[a]	3.00[a]	3.17[b]	3.23[bc]	3.82[d]	.02
Carcass length, cm	78.0	78.0	79.1	77.4	78.2	.60
Backfat depth, cm	3.34	3.21	3.30	3.26	3.25	.04
Area loin-eye, sq cm	27.7[a]	26.2[ab]	26.2[ab]	24.9[b]	22.0[c]	.03
Wt lean cuts, kg	39.0[a]	39.0[a]	39.1[a]	38.7[a]	35.7[b]	.30

[1] Performance means adjusted to a common on test weight of 20.9 kilogram.

[2] SE= standard error of the mean.

[3] Each value is the mean for two replicates of eight pigs per replicate housed and fed individually. Means in each row with different superscript letters are different ($P<.05$).

soybean meal protein can be replaced by protein from peanut meal without affecting growth rate and feed efficiency which are the two most important measures of swine performance. Replacing 50% of the supplemental protein from soybean meal with peanut meal protein does produce a slight but significant ($P<.05$) decrease in growth rate and feed efficiency. These findings are similar to those reported by Sewell *et al.* (6) and Kornegay *et al.* (3) which indicated that peanut meal could replace up to 50% of the soybean meal in swine diets without affecting the performance adversely.

Marked increases in per acre yields of peanuts have been made since these earlier feeding trials with peanut meal. These increases in yields are due primarily to improved varieties, cultural practices and weed control measures. Apparently the protein quality of the peanut meal has not been improved to as great an extent as per acre yields. However, protein quality of peanuts can be improved by increasing the amounts of lysine, methionine and tryptophan which are the three limiting amino acids in peanut meal. Conkerton *et al.* (2) found that certain peanut genotypes have more methionine than other similar genotypes which indicates that peanut geneticists may be able to produce a cultivar which will contain a favorable balance of the 10 amino acids essential for swine.

Carcass traits of pigs on diets with varying amounts of peanut meal and soybean meal are shown in Table 2. Carcass length and average backfat depth were similar ($P>.05$) for pigs on all five diets; however, loin-eye area was decreased ($P<.05$) for pigs on Diets 4 and 5. Pigs on these two diets had smaller loin-eye areas by 10% and 20% ($P<.05$), respectively, than pigs on Diet 1. Likewise, pigs on Diet 5 had 8.5% less lean cuts ($P<.05$) than pigs on Diet 1. Thus, substituting high levels of peanut meal for soybean meal in the diet of growing-finishing pigs does adversely affect muscle development, but peanut meal can be used to supply at least 50% of the supplemental protein without affecting carcass traits ($P>.05$).

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