RAW MUNGBEANS AS A PROTEIN SOURCE FOR SWINE GESTATION DIETS

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Story in Brief

A study involving 280 gilts was conducted to determine the value of mungbeans as a protein source for gestating swine. Gilts from two growth lines were fed either soybean meal or a combination of mungbeans and soybean meal (89% mungbeans and 11% soybean meal) as the protein supplement for sorghum grain based diets during gestation. The study was conducted over three seasons. Gilts fed the mungbean diet gained less weight during gestation and lost less weight during lactation. Pig and litter birth and 21 day weights were lower in gilts fed the mungbean diet in two of the three seasons. Pig and litter weaning weights (42 days) were lower in gilts fed the mungbean diet in all three seasons. No effect of dietary treatment on litter size or survival rate was observed. These data suggest that a level of 19.80 percent mungbeans in the diet of gilts during gestation may adversely affect weight gain and subsequent lactation performance. Additional studies are needed to determine the maximum level of mungbeans which can be fed to gilts during gestation.

(Key Words: Mungbeans, Protein Source, Gestation)

Introduction

Previous research at Oklahoma State University has shown that mungbeans can be used to replace from 25 to 50% of the supplemental lysine from soybean meal (7.5 to 12 percent of the diet) for growing or finishing swine, respectively, without affecting performance. Growth inhibitors present in mungbeans may decrease performance when fed at higher levels. Recent results have shown that raw soybeans can be fed to gestating gilts with no detrimental effects, suggesting that older swine may be less susceptible to inhibitors. Feeding high levels of mungbeans as the protein source for gestating gilts has not been studied. This study was conducted to compare the reproductive performance of gilts fed corn based gestating diets in which the supplemental protein was supplied by soybean meal or a combination of raw mungbeans and soybean meal. Mungbeans were included in the diet at a level at which tryptophan became limiting (supplemental protein was 89% mungbeans and 11% soybean meal).

Experimental Procedures

This study was conducted at the Southwestern Livestock and Forage Station, El Reno, Oklahoma in the 1983 fall and 1984 spring and fall farrowing seasons. A total of 280 crossbred gilts were randomly allotted from two lines selected for rapid or slow growth to two dietary

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treatments (Table 1). Treatments were: (1) a sorghum grain based gestation diet in which supplemental protein was supplied by soybean meal (2) a sorghum grain based gestation diet with a combination of raw mungbeans and soybean meal providing the supplemental protein. Mungbeans were included at a level at which tryptophan became limiting (supplemental protein was 89% mungbeans and 11% soybean meal). Mungbeans were ground moderately fine with the same hammermill and screen size used for grinding the grain portion of the diet. Both diets were started at the initiation of the breeding season.

All gilts were housed in outside dirt lots during gestation and group fed five pounds of feed per head per day. At day 110 of pregnancy, gilts were moved to individual farrowing crates, and litters were penned separately until weaned at 42 days. Gilts were fed a common lactation diet (Table 1) once daily (4.5 lb./day) from the time they were moved into individual farrowing stalls at 109 days of gestation. After parturition, gilts were allowed to consume the lactation diet ad libitum for the duration of the 42 day lactation period. All gilts were weighed at breeding, 109 days of gestation and 42 days postpartum, when their litters were weaned. Pig weights and litter size were recorded at birth, 21 and 42 days of age. Pigs had access to creep feed from 21 to 42 days of age.

Table 1. Composition of experimental diets.

Ingredient	Gestation Diet		Lactation Diet
	Control	Mungbean	
Sorghum grain, ground	81.22	73.23	77.84
Soybean meal, 44%	14.39	2.48	17.82
Ground mungbeans	---	19.80	---
Dicalcium phosphate	1.76	1.91	1.68
Calcium carbonate	1.04	.99	1.07
Salt	.34	.34	.34
Vitamin-trace mineral mix[a]	.25	.25	.25
Chlortetracycline[b]	1.00	1.00	1.00
Calculated composition			
Protein, %	13.64	13.03	14.85
Lysine, %	.62	.62	.68
Calcium, %	.84	.84	.84
Phosphorus	.63	.63	.63

[a]Supplied 800,00 IU Vitamin A, 80,000 IU Vitamin D, 3,400 IU Vitamin E, 800 mg riboflavin, 4,000 mg pantothenic acid, 5,400 mg niacin, 4 mg Vitamin B_{12}, 660 mg menadione sodium bisulfite, .4% manganese, 3.0% iron, .004% selenium, .008% iodine, .4% copper and 4.0% zinc per lb of premix

[b]Supplied 200 g. chlortetracycline/ton of complete feed.

Results and Discussion

Feeding mungbeans at a level of 19.80 percent of the diet during gestation reduced ($P < .05$) weight gain (Table 2). Gilts fed the mungbean diet tended to lose less weight during lactation ($P < .10$). The failure of the mungbean diet to support equivalent weight gains suggest that amino acid utilization of mungbeans was depressed since the diet was formulated based upon chemically determined amino acid values (with the exception of tryptophan). This could be due to either poor amino acid availability or proteolytic enzyme inhibitors present in mungbeans.

Mungbeans in the diet during gestation had no effect on litter size at birth, 21 days or 42 days (Table 3). Similarly, survival rate from birth to 21 days, birth to 42 days, or 21 days to 42 days was not affected by source of protein in the diet during gestation.

A season by treatment interaction for individual and litter birth and 21 day weight was detected, therefore results are presented within season (Table 4). During the fall, 1983 season, individual and litter birth weight was lower ($P < .01$ and $P < .05$, respectively) in pigs produced by gilts fed the mungbean diet during gestation compared to those fed the control diet. Similarly, individual 21 day weights were lower ($P < .05$) in pigs from gilts fed the mungbean diet. However, during the spring, 1985 season, pig weights at birth and 21 days were similar among gilts fed either the soybean meal or mungbean diet during gestation. During the fall, 1984 season, all pig weights were adversely affected ($P < .01$) in gilts fed the mungbean diet during gestation. These data suggest that mungbeans fed at a level of 19.80 percent of the diet may adversely affect pig birth weight and gain to 21 days of age. Seasonal effects may be explained by variation in source of mungbeans for the various trials.

The effect of source of protein in the diet during gestation on 42 day pig weight is presented in Table 5. Individual weaning weight (42 days) was reduced in both growth lines fed mungbeans during gestation ($P < .01$). Similarly, litter weight at weaning in both growth lines was lower ($P < .05$) in gilts fed mungbeans when compared to litter weight in

Table 2. The effect of feeding a soybean meal or mungbeans supplemented sorghum grain based diet to gilts during gestation on body weight change.

Item	Diet[a]	
	Control	Mungbean
Gilts per treatment, no.	146	134
Wt. change during gestation, lb.	129.51[a]	121.99[b]
Wt. change during lactation, lb.	-35.46[c]	-28.89[d]

[ab]Means in the same row that do not have a common superscript differ ($P < .05$).
[cd]Means in the same row that do not have a common superscript differ ($P < .10$).

Table 3. The effect of feeding a soybean meal or mungbean supplemented sorghum grain based diet to gilts during gestation on litter weight and survivability.

Item	Diet[a] Control (N=143)	Mungbean (N=137)
Litter Size, (n)		
Birth	9.49	9.52
21 days	7.55	7.45
42 days	7.23	7.40
Survival Rate, (%)		
Birth to 21 days	80.41	79.77
Birth to 42 days	78.17	78.01
21 days to 42 days	97.02	97.42

[a]No differences (P<.05) were noted between diets

Table 4. The effect of feeding the control vs mungbean diet during gestation on pig birth weight and 21 day weight[a].

Year-Season Farrowed	Diet[a] Control	Mungbean
Fall, 1983		
Individual birth wt, lb.	3.30[b]	3.17[c]
Individual 21 day wt, lb.	11.31[d]	10.89[e]
Litter birth wt, lb.	31.50[d]	29.92[e]
Litter 21 day wt, lb.	84.41	82.19
Spring, 1983		
Individual birth wt, lb.	3.37	3.37
Individual 21 day wt, lb.	12.25	12.41
Litter birth wt, lb.	31.66	31.66
Litter 21 day wt, lb.	91.52	92.40
Fall, 1984		
Individual birth wt., lb.	3.21[b]	2.97[c]
Individual 21 day wt., lb.	11.84[b]	10.96[c]
Litter birth wt., lb.	30.65[b]	28.09[c]
Litter 21 day wt., lb.	89.21[b]	82.19[c]

[a] Year-Season by treatment interaction (P<.05).
[bc]Means in the same row that do not have a common superscript differ (P< .01).
[de]Means in the same row that do not have a common superscript differ (P<.05).

Table 5. The effect of feeding the control vs mungbean diet during gestation on individual and litter weaning weight.[a]

Item	Rapid Growth Line Treatment		Slow Growth Line Treatment	
	Control	Mungbeans	Control	Mungbeans
Individual Weaning Wt., lb.	26.33[b]	23.88[c]	22.69[b]	22.03[c]
Litter Weaning Wt., lb.	189.67[d]	170.74[e]	163.85[d]	161.05[e]

[a] Line X treatment interaction (P<.01).
[bc] Means within selection line in the same row that do not have a common superscript differ (P<.01).
[de] Means within selection line in the same row that do not have a common superscript differ (P<.05).

gilts fed the control corn-soybean diet during gestation. However, for both individual weaning weight and litter weaning weight, the magnitude of the decrease in performance was much greater in the rapid growth lines than in the slow growth line resulting in a line by treatment interaction (P<.01). It is evident that depressing effects of mungbeans on pig weight observed at birth and at 21 days continue to weaning.

These data indicate that mungbeans fed at 19.80 percent of the diet during gestation adversely affected weight gain and subsequent lactation performance of gilts. Even though older swine may be less susceptible to inhibitors present in legume seed, it appears that the level of mungbeans used in this experiment exceeded the capacity of gilts to overcome the proteolytic enzyme inhibitors present in mungbeans. Additional studies are needed to determine the level of mungbeans which can be utilized by gestating gilts without adversely affecting performance.