RAW MUNGBEANS AS A PROTEIN SOURCE FOR GESTATING GILTS

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Story in Brief

A total of 546 crossbred gilts from six seasons were used to evaluate raw ground mungbeans as a partial replacement for soybean meal in diets of bred gilts. A control diet consisting of sorghum grain and soybean meal was fed in all six seasons. During three seasons the treated group was fed a similar diet with the supplemental protein being 89% mungbeans and 11% soybean meal (high level). In the other three seasons the treatment group was fed the control diet with the supplemental protein being 61% mungbeans and 39% soybean meal (moderate level). Feeding the high level of mungbeans resulted in decreased weight gain in gestation and less weight loss during lactation as compared to gilts fed the control diet. Little difference was noted in litter size at birth but litter size at 21 and 42 days for gilts fed the moderate level of mungbeans was less than those fed the control diet. Little difference was noted on survival rate to 21 or 42 days or individual and litter weights at birth and 21 days. When weighed at 42 days pigs from gilts fed the high level of mungbeans had a lower individual pig weight and less litter weight than pigs from gilts fed the control diet. This study suggests that moderate or high levels of mungbeans may result in decreased survivability to 21 and 42 days and decreased individual pig and litter weights at 42 days.

(Key words: Swine, Mungbeans, Reproductive Performance)

Introduction

Oklahoma is the leading state in mungbean production in the United States with 50,000 to 70,000 acres in production annually. During the harvesting and processing of mungbeans for the canning industry, the undersized beans or split-beans are of little economic value and have traditionally been utilized in livestock feeds.
In addition, overproduction has, at times, resulted in a depressed market and considerable interest in feeding the surplus beans to livestock.

Since mungbeans are high in protein (approximately 26%) and lysine (approximately 1.8%), they could be an alternative protein source and energy source for use in swine diets. However, growth inhibitors (sometimes referred to as trypsin inhibitors) are know to be present in raw mungbeans. The use of raw mungbeans may be limited in swine rations. Thus the objective of this study was to determine if the supplemental protein provided by soybean meal in a bred sow ration could be partially replaced by ground raw mungbeans.

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Experimental Procedure

A total of 546 crossbred gilts bred to crossbred boars (1983 fall, 1984 spring, 1984 fall, 1985 spring, 1985 fall and 1986 spring) were randomly allotted from two lines selected for rapid or slow growth to the dietary treatments. A control sorghum grain-soybean meal type diet (control) was fed each season (Table 1). In the first three seasons, the other dietary treatment (High level) was a sorghum grain based gestation diet with a combination of raw ground mungbeans and soybean meal providing the supplemental protein (Table 1). Mungbeans were included at a level at which tryptophan became limiting which resulted in a supplemental protein containing 89% mungbeans and 11% soybean meal with mungbeans providing 85% of the supplemental lysine.

In the last three seasons the treatment group (moderate level) was the gestation diet with one-half of the supplemental lysine supplied by mungbeans at the expense of soybean meal which resulted in supplemental protein containing 61% mungbeans and 39% soybean meal (Table 1).

In all seasons, gilts were housed outside in dirt lots during gestation and group fed five lb. of feed per head per day. At day 110

Table 1. Composition of experimental diets.

	Gestation diets			
Ingredients, %	Control (1)	Mungbeans moderate level (2)	Mungbeans high level (3)	Lactation diets
Sorghum grain, ground	81.22	76.63	73.23	77.84
Soybean meal, 44%	14.39	7.30	2.48	17.82
Mungbeans, ground[a]	-----	11.51	19.80	-----
Dicalcium phosphate	1.76	1.86	1.91	1.68
Calcium carbonate	1.04	1.01	.99	1.07
Salt	.34	.34	.34	.34
Vitamin-trace mineral mix[b]	.25	.25	.25	.25
Chlorotetracycline[c]	1.00	1.00	1.00	1.00
Total	100.00	100.00	100.00	100.00
Calculated composition, %				
Protein	13.64	13.03	13.03	14.85
Lysine	.62	.62	.62	.68
Calcium	.84	.84	.84	.84
Phosphorus	.63	.63	.63	.63

[a] 27.0, 1.86, 1.10, .82, .20 and .34% for crude protein, lysine, isoleucine, threonine, tryptophan and methionine + cystine, respectively.

[b] Supplied 800,000 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, 1.5 g manganese, 13.6 g iron, 18 mg selenium, 3.6 mg iodine, 1.8 g copper and 18 g zinc per lb of premix.

[c] Supplied 200 g chlorotetracycline per ton of complete feed.

of pregnancy, gilts were moved to individual farrowing crates and litters were penned seperately until weaning at 42 days. Beginning at day 110, all gilts were fed a common lactation diet (Table 1) at a rate of 4.5 lb. per head per day until farrowing. After farrowing, the gilts were self-fed the lactation diet for the duration of the 42 day lactation period. Pigs had access to creep feed from 21 to 42 days of age.

Results and Discussion

Dietary treatment effects on weight change during gestation and lactation and subsequent reproductive performance is shown in Table 2. Feeding the high level of mungbeans (19.80% of the diet) decreased gestation weight gain as compared to the gilts fed the control diet ($P<.05$) or the moderate level of mungbeans (11.51% of the diet; ($P<.05$). Conversely, gilts fed the high level of mungbeans lost less weight during lactation than those fed the other two treatments and were different ($P<.05$) than those fed the control diet. This is consistent with other studies where sow weight loss during lactation is greatest in sows which have the greatest weight gain during gestation.

No significant difference was noted among dietary treatments for litter size at birth but litter size at 21 and 42 days was less for

Table 2. The effect of feeding raw mungbeans to gestating gilts on weight change, litter size, survival rate and litter weight.

Item	Control (1)	Mungbeans moderate level (2)	Mungbeans high level (3)
No. gilts	289	116	141
Weight at breeding, lb	286.82	283.80	282.70
Gestation gain, lb	123.24[a]	126.26[a]	115.82[b]
Lactation gain, lb	-34.48[a]	-33.46[ab]	-21.91[b]
Litter size			
Birth	9.60	9.24	9.56
21 days	7.95[a]	7.27[b]	7.91[ab]
42 days	7.72[a]	7.15[b]	7.72[ab]
Survival rate, %			
Birth to 21 days	83.80	80.11	84.11
Birth to 42 days	81.43	78.93	82.01
Pig weight			
Wt at birth, lb	3.34	3.34	3.25
Wt at 21 days, lb	11.42	11.54	11.26
Wt at 42 days, lb	24.00[a]	24.68[a]	22.78[b]
Litter weight			
Wt at birth, lb	31.54	30.48	30.24
Wt at 21 days, lb	89.19	84.13	86.52
Wt at 42 days, lb	181.50[c]	176.18[cd]	171.15[d]

[a,b]Means with different superscripts differ ($P<.05$).
[c,d]Means with different superscripts differ ($P<.10$).

gilts fed mungbeans at the moderate level than those fed either the control diet or the high level of munbeans. Significant differences ($P<.05$) were noted for both litter size at 21 and 42 days between gilts on treatments 2 and 1. Variation in the mungbeans fed in the first three seasons (high level) as compared to the mungbeans fed the last three seasons (moderate level) may be the explanation for the decrease in litter size at 21 or 42 days for gilts fed the moderate level of mungbeans but not the high level of mungbeans.

Only small differences ($P>.10$) were noted among treatments for survival rate from birth to 21 or 42 days. However, gilts fed the moderate level of mungbeans (treatment 2) tended to have a lower survival rate than those fed the control diet or the high level of mungbeans.

Little difference was noted among treatments for individual pig weight or litter weights at birth or 21 days. However pigs from gilts fed the high levels of mungbeans had a lower average litter weights at 42 days ($P < .10$) than pigs from gilts fed the control diet. This study suggests that mungbean levels of 11.5 to 19.8% of the diet may result in decreased litter size at 21 and 42 days and decreased individual pig and litter weights at 42 days. Growth inhibitory factors in raw mungbeans may explain the decrease in reproductive performance shown in Table 2.