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Abstract

A total of 112 finishing pigs (avg initial wt of 139 lb) was used to determine the effects of adding extruded soybeans and/or sorghum grain to diets for finishing pigs. Treatments were: 1) sorghum-soybean meal control (sorghum-SBM), 2) extruded soybeans and ground sorghum, 3) SBM and extruded sorghum, and 4) extruded soybeans and sorghum. All diets were isocaloric and isolysinic. Using extruded soybeans and/or sorghum improved efficiency of gain compared to the sorghum-SBM control. This response was apparently related to the improved digestibilities of dry matter and nitrogen with the use of extruded ingredients. Optimum digestibility of dry matter and nitrogen was achieved when just the sorghum was extruded, but optimum growth performance (ie., efficiency of gain) was achieved when extruded sorghum and soybeans were added to the diet.; Swine Day, Manhattan, KS, November 15, 1990

Keywords

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EFFECT OF EXTRUSION ON THE NUTRITIONAL VALUE OF SOYBEANS AND SORGHUM GRAIN IN FINISHING PIGS

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Summary

A total of 112 finishing pigs (avg initial wt of 139 lb) was used to determine the effects of adding extruded soybeans and/or sorghum grain to diets for finishing pigs. Treatments were: 1) sorghum-soybean meal control (sorghum-SBM), 2) extruded soybeans and ground sorghum, 3) SBM and extruded sorghum, and 4) extruded soybeans and sorghum. All diets were isocaloric and isolysinic. Using extruded soybeans and/or sorghum improved efficiency of gain compared to the sorghum-SBM control. This response was apparently related to the improved digestibilities of dry matter and nitrogen with the use of extruded ingredients. Optimum digestibility of dry matter and nitrogen was achieved when just the sorghum was extruded, but optimum growth performance (i.e., efficiency of gain) was achieved when extruded sorghum and soybeans were added to the diet.

(Key Words: GF, Performance, Process, Sorghum.)

Introduction

Extrusion involves heating and compressing simultaneously by a screw type auger. Heat is generated when feedstuffs are augured through the screw chamber under extreme pressure that creates friction. This friction can result in product temperatures of up to 360° F, which is more than adequate to destroy the trypsin inhibitor present in soybean. The pressure and heat rupture the oil cells, which allows the oil to be reabsorbed into the soybean residue.

Extrusion of cereal grains disorganizes the semicrystalline structure of the starch granules. This makes the starch more easily attacked by digestive enzymes and may enhance efficiency of utilization of the cereal grain by the finishing pigs.

Therefore, the objectives for this finishing pig study were to determine the effect of extrusion in the nutritional value of milo and soybeans and to determine if the increased feeding value of the individual ingredients is additive when they are added to diets in combination.

Procedures

One hundred twelve finishing pigs, averging 139 lb, were allotted to one of four dietary treatments based on initial weight, sex, and ancestry. There were seven pigs per pen and four pens per treatment. Pigs were housed in a modified, open fronted building, with 50% solid

concrete and 50% concrete slat flooring. Each pen (6 × 16 ft) contained one, two-hole self-feeder and a nipple waterer.

The treatments used in the study were as follows: 1) control (ground milo, soybean meal, and soy oil); 2) ground milo and extruded soybeans; 3) extruded milo, soybean meal and soy oil; 4) extruded milo and soybeans. Diets were formulated to be isocaloric and isolysinic, with the same ratio of g lysine to Kcal of metabolizable energy.

Three weeks after initiation of the trial, chromic oxide was added to the diets (.25%). After a 4-d adjustment period, fecal samples were collected from eight pigs on each treatment. The samples were dried, ground, and analyzed for chromium, DM, and N contents, so that apparent DM and N digestibilities could be determined.

Results and Discussion

Growth performance of pigs fed the experimental diets is given in Table 2. Rate of gain was not affected by dietary treatment (P>.19). However, pigs fed the sorghum-SBM control ate more fed (P<.003) and were less efficient (P<.02) than pigs fed diets with extruded soybeans and/or extruded sorghum. A comparison of F/G values indicated that using extruded soybeans or sorghum improved efficiency of gain by 5% (3.11 vs 3.27), but using extruded soybeans and sorghum improved efficiency of gain by 9% (2.96 vs 3.27).

Apparent digestibility values (Table 2) also indicated that extrusion processing of soybeans and/or sorghum improved the nutritional value of the diets. Dry matter digestibility was 6% higher (85.8 vs 81.2%) with extruded soybeans and/or sorghum compared to the sorghum-SBM control diet. Extrusion of sorghum improved dry matter digestibility more than extrusion of the soybeans, as might be expected because sorghum accounted for 76% of the diet and extruded soybeans accounted fro only 21% of the diet. Extruding the sorghum also had a greater positive effect on nitrogen digestibility than extruding the soybeans, even though the soybeans supplied more of the total dietary crude protein.

In conclusion, using extruded soybeans and/or sorghum in diets for finishing pigs improved performance and nutrient digestibility compared to a simple sorghum-SBM diet. Although optimum digestibility was achieved by extruding only the sorghum, optimum efficiency of gain was achieved when both sorghum and soybeans were extruded and used in the diet.

Table 1. Diet Composition

Ingredient, %	Control (SBM)	Extruded soybeans
Sorghum	80.70[a]	76.09[a]
Soybean meal (48% CP)	14.90	—
Extruded soybeans	—	21.09
Soy oil	1.50	—
Monocalcium phosphate	1.08	1.00
Limestone	1.02	1.02
Salt, vit-mix, tm-mix, se-mix, antibiotic	.80	.80
Calculated analysis:		
Crude protein, %	14.41	14.51
Lysine, %	.65	.65
Ca, %	.65	.65
P, %	.55	.55
ME, Kcal/lb	1482	1482
g Lysine/Kcal ME	2.00	2.00

[a]For diets with extruded milo, ground milo was replaced on a lb for lb basis.

Table 2. Effect of Extrusion on the Nutritional Value of Soybeans and Sorghum in Finishing Pigs

		Extrusion treatment			
Item	Control	Soybeans	Sorghum	Soybeans and sorghum	CV
Growth performance[a]					
ADG, lb[b]	2.24	2.27	2.17	2.21	4.7
ADFI, lb[c]	7.33	7.07	6.72	6.55	3.4
F/G[d]	3.27	3.11	3.11	2.96	4.0
Apparent digestibility, %[e]					
DM[f]	81.2	83.1	88.0	86.4	3.0
N[g]	68.5	73.1	84.2	84.6	5.2

[a]A total of 112 finishing pigs, avg initial wt of 139 lb, avg final wt of 246 lb. There were seven pigs per pen and four pens per treatment.
[b]No treatment effect (P>.19).
[c]Control vs others (P<.003); extruded soy or extruded sorghum vs extruded soy and sorghum (P<.04); extruded soy vs extruded sorghum (P<.07).
[d]Control vs others (P<.02); extruded soy or extruded sorghum vs extruded soy and sorghum (P<.08).
[e]A total of eight pigs per treatment.
[f]Control vs others (P<.001); extruded soy vs extruded sorghum (P<.001).
[g]Control vs others (P<.001); extruded soy or extruded sorghum vs extruded soy and sorghum (P<.003); extruded soy vs extruded sorghum (P<.001).