EFFECTS OF ADDING BEEF TALLOW TO DIETS WITH SORGHUM-BASED DRIED DISTILLERS GRAINS WITH SOLUBLES ON GROWTH PERFORMANCE AND CARCASS CHARACTERISTICS IN FINISHING PIGS

C. Feoli, J. D. Hancock, S. Issa, T. L. Gugle, S. D. Carter[1], and N. A. Cole[2]

Summary

A total of 112 barrows (average weight of 158 lb) were used in a 65-d growth assay to determine the effects of adding beef tallow (a source of saturated fat) into diets with high inclusion of dried distillers grains with solubles (DDGS). The pigs were sorted by ancestry and blocked by weight with seven pigs/pen and four pens/treatment. Treatments were a corn-soybean, meal-based control and diets having 40% DDGS (US Energy Partners, Russell, KS) with none, 2.5, and 5% added tallow. Feed and water were consumed on an *ad libitum* basis until the pigs were slaughtered (average wt of 287 lb) to allow collection of carcass data and jowl samples. Fatty acid composition of the jowl samples was used to calculate iodine value as an indicator of carcass fat firmness. Overall (d 0 to 65), the corn-soy control supported greater ADG ($P< 0.03$) and ADFI ($P<0.001$) with no difference in F/G ($P>0.35$) compared to the DDGS treatments. Increasing fat additions from none to 5% in diets with DDGS did not affect ADG ($P>0.76$) but improved (linear effect, $P<0.03$) F/G by 9%. As for carcass data, adding DDGS to diets reduced HCW ($P<0.004$) and dressing percentage ($P<0.03$) but increased iodine value of jowls ($P<0.001$) compared to pigs fed the corn-based control diet. Among the DDGS treatments, hot carcass weight (linear increase, $P<0.07$), dressing percentage (linear increase, $P<0.07$), and backfat thickness (quadratic decrease, $P<0.08$) responded positively as fat addition to the diets was increased from none to 5%. However, changes in iodine value indicated a trend for deposition of softer fat in pigs fed DDGS when additions of beef tallow were increased in the diet (linear effect, $P<0.06$). In conclusion, adding beef tallow to diets with DDGS improved efficiency of growth and several carcass measurements but did not improve iodine value of jowl fat.

(Key words: DDGS, feed ingredient, meat quality, sorghum.)

Introduction

In conversion of starch to ethanol during the fermentation process, components (such as the vegetable oil) are concentrated by about three times. It is known that nonruminants tend to deposit fat similar to that which they consume and that vegetable oil in dried distillers grains with solubles (DDGS) will soften the adipose tissue in pig carcasses. So, there is a question of whether feeding a source of saturated fat can counteract the negative effects of DDGS on carcass fat firmness. The objective of the experiment reported herein was to

[1]Department of Animal Science, Oklahoma State University.
[2]USDA/ARS, Bushland, TX.

determine the effects of adding a source of saturated fat (beef tallow) into diets with sorghum-based DDGS.

Procedures

A total of 112 barrows (average initial wt of 158 lb) were used in a 65-d growth assay. The pigs were sorted by ancestry, blocked by weight, and assigned to pens. There were seven pigs/pen and four pens/treatment. The pigs were housed in a finishing facility having 6-ft x 16-ft pens with half solid and half slatted concrete flooring. Each pen had a self-feeder and nipple waterer to allow *ad libitum* consumption of feed and water until the pigs were slaughtered at an average wt of 287 lb.

Treatments were a corn-soybean, meal-based control and diets having 40% sorghum-based DDGS (US Energy Partners, Russell, KS) with none, 2.5, and 5% added tallow (Table 1). The control diet was formulated to 0.90% lysine, 0.60% Ca, and 0.50% total P for d 0 to 31 and 0.70% lysine, 0.55% Ca, and 0.45% total P for d 31 to 65. Nutrient:calorie ratios were kept constant for diets with added tallow.

Pigs and feeders were weighed at d 0, 31, and 65 to allow calculation of ADG, ADFI, and F/G. The pigs were killed on d 65 (average wt of 287 lb) and carcass data were collected. Because differences in slaughter weight, and thus hot carcass weight, are known to affect carcass measurements, hot carcass weight was used as a covariate to separate any effect of treatment from the effects of slaughtering our pigs at a constant age rather than constant weight. Samples of jowl fat were collected and a fatty acid profile was determined to allow estimation of iodine value (AOCS Cd 1c-85 Official Method) as an indicator of carcass firmness.

All data were analyzed as a randomized complete block design using the MIXED procedure of SAS. Orthogonal contrasts and polynomial regression were used to separate treatment means with comparisons among the control vs DDGS treatments and linear and quadratic effects of increasing tallow additions in diets with DDGS.

Results and Discussion

The corn-soybean meal control diet supported greater ADG and ADFI for d 0 to 31 ($P<0.04$) and 0 to 65 ($P<0.03$) with no differences in F/G ($P>0.32$) compared to the DDGS treatments. Increasing tallow additions from none to 5% in diets with DDGS did not affect overall ADG ($P>0.76$) but improved (linear effect, $P<0.03$) F/G by 9%. Thus, as would be expected in a simple corn-soy diet, each 1% fat added to a diet with DDGS increased F/G by about 2%

As for carcass data, adding DDGS to diets reduced HCW ($P<0.004$) and dressing percentage ($P<0.03$) but increased iodine value of jowls ($P<0.001$) compared to pigs fed the corn-based control diet. Among the DDGS treatments, hot carcass weight (linear increase, $P<0.07$), dressing percentage (linear increase, $P<0.07$), and backfat thickness (quadratic decrease, $P<0.08$) responded positively as fat addition to the diets was increased from none to 5%. However, changes in iodine value indicated a trend for deposition of softer fat in pigs fed DDGS when additions of beef tallow were increased in the diet (linear effect, $P<0.06$). Thus, even what traditionally has been considered a source of saturated fat (tallow) will not counteract the negative effects of adding DDGS (a source of unsaturated vegetable oil) to diets for finishing pigs. In conclusion, adding beef tallow to diets with DDGS improved efficiency of growth and several carcass measurements but did not improve iodine value of jowl fat.

Table 1. Composition of Diets, %

	d 0 to 31				d 31 to 65			
Ingredient	Control	0% Tallow	2.5% Tallow	5% Tallow	Control	0% Tallow	2.5% Tallow	5% Tallow
Corn	79.90	53.10	49.32	45.50	84.96	58.10	54.56	50.96
DDGS	---	40.00	40.00	40.00	---	40.00	40.00	40.00
Beef tallow	---	---	2.50	5.00	---	---	2.50	5.00
Soybean meal (46.5% CP)	17.70	4.80	6.00	7.20	12.90	---	1.00	2.00
Limestone	1.09	1.35	1.34	1.35	1.07	1.27	1.31	1.32
Monocalcium P (21% P)	0.73	0.04	0.13	0.22	0.59	-	-	0.08
Salt	0.23	0.10	0.10	0.11	0.23	0.10	0.10	0.11
L-lysine HCl	0.20	0.47	0.47	0.48	0.12	0.39	0.39	0.39
L-threonine	0.03	-	-	-	-	-	-	-
Vitamin premix	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Trace mineral premix	0.03	0.05	0.05	0.05	0.04	0.05	0.05	0.05
Antibiotic [a]	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Calculated analysis [b]								
Lys, %	0.90	0.90	0.93	0.96	0.70	0.70	0.73	0.75
Ca, %	0.60	0.60	0.62	0.64	0.55	0.55	0.57	0.59
P total, %	0.50	0.50	0.52	0.53	0.45	0.45	0.47	0.48
Iodine value [c]	120	118	99	87	119	116	90	86

[a]To provide 40 g/ton of tylosin.
[b]Nutrient:calorie ratios were kept constant for diets with added tallow.
[c]As calculated from fatty acid profile of the diets.

Table 2. Effects of Adding Beef Tallow to Diets with Sorghum-Based DDGS on Growth Performance and Carcass Characteristics in Finishing Pigs [a]

		40% DDGS				P value		
Item	Control	0% Tal-low	2.5% Tallow	5% Tal-low	SE	Control vs DDGS	Tallow lin	Tallow quad
D 0 to 31								
ADG, lb	2.15	1.95	1.91	1.93	0.08	0.04	--- [b]	---
ADFI, lb	6.62	6.40	6.21	5.75	0.18	0.03	0.02	---
F/G	3.08	3.28	3.25	2.98	0.07	---	0.02	---
D 0 to 65								
ADG, lb	2.12	1.96	1.94	1.95	0.06	0.03	---	---
ADFI, lb	7.34	6.98	6.44	6.33	0.10	0.001	0.003	0.12
F/G	3.46	3.56	3.32	3.25	0.08	---	0.03	---
HCW, lb	210.5	196.3	196.8	203.8	7.0	0.004	0.07	---
Dress, % [c]	71.3	69.3	69.5	70.7	0.5	0.03	0.07	---
Carcass lean, % [c]	53.3	52.4	53.9	53.7	0.3	--	0.03	0.08
Backfat thickness, in [c]	0.76	0.80	0.71	0.72	0.02	---	0.03	0.08
Loin depth, in [c]	2.03	1.95	1.98	1.97	0.04	---	---	---
Iodine value [c]	67.9	72.3	73.3	74.2	0.6	0.001	0.06	---

[a]A total of 112 barrows (initial weight of 158 lb) with seven pigs/pen and four pens/treatment.
[b]Dashes indicate *P*>0.15.
[c]Hot carcass weight used as a covariate.