Effects of Cracked Corn on Growth Performance and Stomach Lesions in Finishing Pigs

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Summary

A total of 208 pigs (104 barrows and 104 gilts, initial average 138 lb) were used in a 63-d experiment to determine the effects of adding cracked corn to diets for finishing pigs. The pigs were sorted by ancestry and blocked by weight with 13 pigs per pen and 4 pens per treatment. Treatments were corn-soybean meal-based with none, 10, 20, or 40% roller-milled corn (mean particle size of 3,549 µm). Particle size for the none, 10, 20, and 40% cracked corn diets were 684, 926, 979, and 1,187 µm, respectively. Feed and water were offered ad libitum until slaughter (average final BW of 268 lb) at a commercial facility. Overall (d 0 to 63), increasing cracked corn from none to 40% had no effect on ADG ($P > 0.98$) and ADFI ($P > 0.41$), but F/G was numerically poorer (linear, $P < 0.11$). Adding cracked corn had no effect on HCW ($P > 0.17$) or backfat thickness ($P > 0.69$), but dressing percentage was decreased (linear effect, $P < 0.05$). For both stomach keratinization and ulcer scores, as the percentage of cracked corn increased, there was a decrease (linear, $P < 0.009$) in scores for ulcers and stomach keratinization (scale of 0 = none, 1 = mild, 2 = moderate, and 3 = severe), but even the worst treatment had an average lesion score of less than mild. Our results indicate that increasing cracked corn from none to 40% of diets for finishing pigs did not affect rate of gain but worsened F/G and dressing percentage with only slight improvements in scores for stomach lesions.

Key words: cracked corn, finishing pigs, stomach ulcers

Introduction

In finishing pigs, a 1.2 to 1.4% improvement in feed efficiency occurs for each 100-µm reduction in the particle size of corn. While decreasing particle size is an important economic factor in overall feed cost per pig, several studies have shown an increase in stomach lesions with a reduction of diet particle size. These increases in stomach lesions can lead to higher mortality from ulcer development. Colleagues in the poultry industry have suggested that feeding whole and cracked grain can improve gut health without negatively affecting growth performance in broilers. However, research is not currently available to determine if a similar strategy could be effective in swine. The objective of this experiment is to determine the effects on growth performance, carcass measurements, and stomach lesions when cracked corn is added to diets for finishing pigs.

Procedures

The Kansas State University (K-State) Institutional Animal Care and Use Committee approved the protocol used in this experiment. The experiment was completed at the K-State Swine Teaching and Research Center.

A total of 208 pigs (104 barrows and 104 gilts, initially138 lb) were used in a 63-d growth assay. The pigs were sorted by sex and ancestry, blocked by weight, and assigned

to pens. There were 13 pigs per pen, 4 pens per treatment. The pigs were housed in a finishing facility with 6-ft x 16-ft pens and 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. Pigs were slaughtered at an average body weight of 268 lb.

Treatments were none, 10, 20, or 40% cracked corn (roller milled to a mean particle size of 3,549 μm; Table 1). Particle size for the none, 10, 20, and 40% cracked corn diets were 684, 926, 979, and 1,187 μm, respectively. All experimental diets were fed in 2 phases (d 0 to 31 and d 31 to 63).

Pigs and feeders were weighed at d 0, 31, and 63 to allow calculation of ADG, ADFI, and F/G. The pigs were harvested on d 63 (average weight of 268 lb), and carcass data were recorded. Stomachs were collected and scored for keratinization and ulcers.

All data were analyzed as a randomized complete block design using the MIXED procedure of SAS (SAS Institute, Inc., Cary, NC). Polynomial regression was used to determine shape of the response to increasing concentration of cracked corn in the diet.

Results and Discussion

Overall (d 0 to 63), increasing the amount of cracked corn in the diet from none to 40% had no effect on ADG or ADFI ($P > 0.41$), but F/G tended to become worse as the percentage of cracked corn was increased (linear, $P < 0.11$; Table 2). Increasing cracked corn had no effect on HCW ($P > 0.17$) or backfat thickness ($P > 0.69$), but dressing percentage was decreased (linear effect, $P < 0.05$). For both stomach keratinization and ulcer scores, there were decreased (linear, $P < 0.01$) scores (scale of 0 = none, 1 = mild, 2 = moderate, and 3 = severe) as dietary cracked corn was increased. However, even though pigs fed diets with 40% cracked corn had the highest numerical score (i.e., the least lesion development), their scores still would be considered less than mild.

In conclusion, our results indicate that increasing cracked corn from none to 40% of the diet for finishing pigs did not affect rate of gain but worsened F/G and dressing percentage with only slight improvements in scores for stomach lesions.

Table 1. Composition of experimental diets[1]

	d 0 to 31				d 31 to 63			
		Cracked corn, %				Cracked corn, %		
Item	Control	10	20	40	Control	10	20	40
Ingredient, %								
Corn, ground[1]	73.88	63.88	53.88	33.88	80.46	70.46	60.46	40.46
Corn, cracked[2]	---	10.00	20.00	40.00	---	10.00	20.00	40.00
Soybean meal (46.5% CP)	21.28	21.28	21.28	21.28	14.96	14.96	14.96	14.96
Soy oil	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Limestone	0.968	0.968	0.968	0.968	1.05	1.05	1.05	1.05
Monocalcium P (21% P)	0.94	0.94	0.94	0.94	0.58	0.58	0.58	0.58
Salt	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35
L-lysine HCl	0.15	0.15	0.15	0.15	0.18	0.18	0.18	0.18
L-threonine	0.05	0.05	0.05	0.05	0.04	0.04	0.04	0.04
Vitamin premix	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Mineral premix	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Antibiotic[3]	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Calculated analysis, %								
CP	16.22	16.22	16.22	16.22	13.84	13.84	13.84	13.84
SID lysine[4]	0.85	0.85	0.85	0.85	0.71	0.71	0.71	0.71
Ca	0.60	0.60	0.60	0.60	0.55	0.55	0.55	0.55
Total P	0.55	0.55	0.55	0.55	0.45	0.45	0.45	0.45

[1] Ground (in a hammermill) to 600 µm.
[2] Cracked (in a roller mill) to 3,549 µm.
[3] To provide 40 g/ton of tylosin.
[4] Standardized ileal digestible lysine.

Table 2. Effects of cracked corn on growth performance, carcass characteristics, and stomach lesions in finishing pigs[1]

		Cracked corn, %				*P* value	
Item	Control	10	20	40	SE	Linear	Quadratic
d 0 to 63							
ADG, lb	2.02	2.10	2.06	2.04	0.05	0.98	0.43
ADFI, lb	5.67	5.99	5.90	5.96	0.28	0.41	0.46
F/G	2.81	2.85	2.86	2.91	0.08	0.11	0.86
Hot carcass weight, lb	196.7	199.8	198.3	194.0	5.43	0.23	0.17
Dress, %	74.0	73.7	73.7	72.7	0.46	0.05	0.66
Backfat thickness, in	1.05	1.05	1.06	1.05	0.04	0.93	0.69
Carcass lean, %[2]	50.9	50.9	50.8	50.9	0.47	0.93	0.72
Stomach keritinization[3]	0.21	0.18	0.08	0.05	0.04	0.008	0.48
Stomach ulceration[3]	0.22	0.04	0.02	0.00	0.04	0.009	0.05

[1] A total of 208 pigs (initial BW of 138 lb) were used.
[2] Fat-free lean index.
[3] Scored on scale: 0 = none, 1 = mild, 2 = moderate, and 3 = severe.