

Effect of Reducing Mean Particle Size of Corn DDGS Using a Roller Mill or a Hammermill on Apparent Total Tract Digestibility of DM, GE, Nitrogen and NDF in Growing and Finishing Pigs

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Summary and Implications

The aim of this study was to test if further grinding of corn DDGS is advantageous in terms of apparent total tract digestibility (ATTD) of DM, GE, nitrogen (N), and NDF in growing and finishing pigs. It was also tested to determine if ATTD was different between hammermill and roller mill grinding methods. There were 3 diets. Each diet consisted of 51% corn ground at 500 microns with a roller mill, and 45% of corn DDGS ground at 450 microns using a hammermill, or 45% corn DDGS ground at 450 microns using a roller mill, or 45% of corn DDGS not further ground (unprocessed) at 650 microns. Results show that particle size reduction either with a roller mill or a hammermill (from 650 to 450 microns) increased ATTD of GE and DM of corn DDGS, tended to increase ATTD of N, but had no effect on ATTD of NDF. Finishing pigs had greater ATTD of GE and CP than growing pigs (tended to be greater for ATTD of DM). There were no effects of growth stage in ATTD of NDF. There were no interactions between particle size reduction and growth stage. In conclusion, reduction of particle size of corn DDGS (650 to 450 microns) either with a roller or with a hammermill has a beneficial effect on digestibility of valuable dietary components in growing and finishing pigs.

Introduction

Reducing mean particle size is thought to increase digestibility mainly by increasing the surface area facilitating enzymatic action. Corn DDGS is an ingredient that is commonly used in swine formulations. These materials are generally important sources of protein and fiber, and a moderate source of net energy. The objectives of this experiment were threefold. First, to test if reducing the mean particle size of corn DDGS (from 650 to 450 microns) using a roller mill or a hammermill increases the apparent total tract digestibility (ATTD) of DM, GE, nitrogen (N) and NDF. Second, to test if there are differences in ATTD between the roller mill and the hammermill. Third, to test if there is an effect of growth stage on digestibility.

Materials and Methods

A total of 24 crossbred growing barrows (BW = 54.7 ± 0.9 kg) and the same number of finishing barrows (BW = 107.8 ± 1.5); PIC 337 sires x C22 or C29; Hendersonville, TN) were housed in individual pens and randomly assigned to 1 of 3 diets. Each diet consisted of 51% corn ground at 500 microns with a roller mill, and 45% of corn DDGS ground at 450 microns using a hammermill, or 45% corn DDGS ground at 450 microns using a roller mill or 45% un-reground corn DDGS at 650 microns. Fecal samples were collected for the last three days of an 11 d feeding period. Titanium dioxide was used as an indigestible marker. Digestibility data were analyzed using the MIXED procedure of SAS. All animals had restricted access to feed (2.5 times the daily maintenance energy requirement) and *ad libitum* access to water for all test periods. Pigs were not fed the same diet in the growing period as they were in the finishing period. Results were analyzed using PROC MIXED of SAS (SAS Inst. Inc., Cary, NC).

Results and Discussion

There were significant differences among dietary treatments for ATTD of DM and GE ($P < 0.001$, and $P < 0.001$ respectively) and ATTD of nitrogen tended to be different among treatments ($P = 0.090$). The digestibility of corn DDGS at 450 was greater than at 650 microns; $P < 0.050$. There was no difference between the 2 processing methods (at 450 microns; $P > 0.050$). Finishing pigs had greater ATTD of DM, GE and nitrogen than growing pigs ($P = 0.090$, $P = 0.026$, $P < 0.001$ respectively), but ATTD of NDF was similar between growing and finishing pigs ($P = 0.335$). There were no interactions between particle size reduction and growth stage ($P > 0.050$). In conclusion, the reduction of particle size of corn DDGS (650 to 450 microns) either with a roller or with a hammermill has a beneficial effect on digestibility of valuable dietary components. The effect was grinding method was the same in both growing and finishing pigs.

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Table 1. Apparent total tract digestibility (ATTD) of DM, GE, nitrogen, and NDF of diets containing corn DDGS.

Item	Growing pigs (55 kg, BW)			Finishing pigs (108 kg, BW)			SEM	<i>P</i> -value		
	HM ¹ 450	RM ² 450	NP ³ 650	HM 450	RM 450	NP 650		Trt	Period	Trt x period
ATTD, %										
DM	79.8 ^{ab}	79.2 ^{bc}	77.9 ^c	81.0 ^a	80.7 ^{ab}	77.8 ^c	0.7	<0.001	0.091	0.435
GE	78.2 ^{bc}	77.7 ^{cd}	76.4 ^{cd}	80.1 ^a	79.9 ^{ab}	76.0 ^d	0.6	<0.001	0.026	0.115
CP	77.5 ^c	77.0 ^c	76.2 ^c	81.5 ^{ab}	81.7 ^a	78.8 ^{bc}	0.9	0.090	<0.001	0.494
NDF	46.6	50.2	44.9	48.5	45.1	44.7	1.4	0.477	0.335	0.727

^{a,b,c} Assess significant differences ($P > 0.050$) between dietary treatments.

¹Hammermill ground at 450 microns.

²Roller mill ground at 450 microns.

³Non-processed, 650 microns (no further ground).