

Title: Influence of Rapid Introduction and Removal of Dietary DDGS on Pig Performance and Carcass Characteristics - NPB #07-144

Investigator: Gerald Shurson

Institution: University of Minnesota

Date Submitted: 1/28/09

Industry Summary:

Pork producers and nutritionists want to use feed ingredients that will optimize pig performance at the lowest cost. Inclusion of DDGS in the diets for grower-finisher pigs may be economical at certain times, but not at other times. So, this puts the producer in the position of weighing the economic benefits of suddenly including economically priced DDGS in diets against any potential reductions in pig performance. We have very little direct evidence of the pig's response to frequent inclusion and removal of DDGS from the diet. If there are no changes in pig performance when switching between DDGS and non-DDGS diets, more pork producers may include DDGS in diets when it is economical, knowing that switching between DDGS and non-DDGS diets will not result in any reduction in pig performance.

The pig's feed intake response to DDGS in the diet is puzzling. Recently, researchers at the Universities of Illinois and Minnesota summarized 23 published studies reporting performance responses of growing-finishing pigs when their diets contained up to 30% DDGS. Average daily feed intake was increased in two experiments, reduced in 6 experiments, and not affected in 15 experiments when DDGS diets were fed. The reasons for this variable feed intake response to DDGS are unclear. There is limited evidence suggesting that alternating between DDGS and non-DDGS diets could decrease feed intake in growing-finishing pigs. Researchers at Kansas State University found that pigs preferred a corn-soybean meal diet over one containing DDGS when offered a side-by-side choice. However, the pigs' preference for the corn-soybean meal diet does not necessarily mean that feed intake and growth rate will be reduced if pigs are only offered a DDGS-containing diet. Other researchers have shown that a reduction in feed intake may occur when switching to bulky ingredients with high fiber content. Consequently, our research group conducted an experiment to determine the effects of switching between corn-soybean meal and corn-soybean meal-DDGS diets on pig performance and carcass quality of finishing pigs.

Two hundred sixteen pigs were housed in one of 24 pens and assigned to one of 4 dietary treatments. Dietary treatments consisted of a corn-soybean meal control (D0), a corn-soybean meal diet containing 20%

These research results were submitted in fulfillment of the Nutritional Efficiency Consortium research projects.

Contributing organizations for 2007 include: Arizona Pork Council, DPI Global, Eli Lilly/Elanco, Iowa Corn Growers Association, Iowa Pork Producers Association, Illinois Corn Marketing Board, Illinois Pork Producers Association, Kansas Corn Commission, Kansas Pork Association, Lucta USA, Minnesota Pork Board, Missouri Pork Producers Association, Monsanto, Mississippi Pork Producers Association, Montana Pork Producers Council, National Corn Growers Association, North Carolina Pork Council, Inc., National Pork Board, Nebraska Pork Producers Association, Inc., Ohio Pork Producers Council, Pioneer Hi-Bred International, Inc., Utah Pork Producers Association and the Wisconsin Pork Association.

This report is published directly as submitted by the projects principal investigator. This report has not been peer reviewed.

For more information contact:

National Pork Board • PO Box 9114 • Des Moines, IA 50306 USA • 800-456-7675 • Fax: 515-223-2646 • pork.org

DDGS fed throughout the study (D20), D20 and D0 diets alternated bi-weekly (D20SW), and a 40% DDGS diet alternated bi-weekly with the D0 diet (D40SW). There were five two-week feeding periods with pigs assigned to D20SW and D40SW treatments starting and ending the trial consuming DDGS diets. Pigs were fed corn-soybean meal diets until the experiment started when pigs weighed about 110 lbs. Dietary treatments had no effect on average daily weight gain. With the exception of feed efficiency, growth performance was not different among pigs fed the control diet continuously, the 20% DDGS continuously or the 20% DDGS and control diets in an alternating pattern. For some reason, pigs fed the 20% DDGS diet continuously were not as efficient as those fed the same diet alternated with the control diet. Pigs switched on and off a 40% DDGS diet were lighter at the end of the 70-day study and produced a lighter carcass than pigs assigned to the other treatments because they tended to consume less feed. Dressing percentage and carcass fat-free lean percentage were not affected by dietary treatments.

Results of this study suggest that the frequent inclusion and removal of 20% DDGS from diets for finishing pigs will not adversely affect pig performance or carcass characteristics. We plan to conduct a similar experiment to determine if consistent responses are observed with lighter pigs. It appears that alternating 40% DDGS in and out of the diet may reduce feed intake and hot carcass weight of finishing pigs.

Table 1. Effects of frequent DDGS inclusion and removal on pig performance and carcass traits

Trait	D0	D20	D20SW	D40SW
Initial wt, lb	113.0	113.0	113.0	113.3
Final wt, lb	247.4 ^{xy}	247.4 ^{xy}	249.1 ^x	243.8 ^y
ADG, lb	1.92	1.92	1.94	1.87
ADFI, lb	5.95 ^{xy}	6.06 ^x	5.97 ^{xy}	5.80 ^y
F:G	3.09 ^{ab}	3.15 ^a	3.08 ^b	3.10 ^{ab}
Hot carcass wt, lb	184.7 ^a	184.3 ^a	185.8 ^a	178.8 ^b
Dressing %	74.8	74.6	74.6	73.8
Carcass lean, %	54.4	54.0	53.8	54.2

^{ab} Within a row means without a common superscript differ (P < 0.05).

^{xy} Within a row means without a common superscript differ (P < 0.10).

Scientific Abstract:

Influence of rapid introduction and removal of dietary corn distillers dried grains with solubles (DDGS) on pig performance and carcass characteristics. A.M. Hilbrands*¹, L. J. Johnston¹, G. C. Shurson², and I. Kim², ¹University of Minnesota, West Central Research and Outreach Center, Morris, ²University of Minnesota, St. Paul

Due to price fluctuation the dietary inclusion of DDGS may only be economical intermittently throughout the growing-finishing period. A study was conducted to determine the effects of rapid introduction and removal of DDGS from growing-finishing pig diets on growth performance and carcass composition. Crossbred pigs (n = 216; BW = 51.3 ± 3.1 kg) were blocked by weight and assigned randomly to one of 24 pens (9 pigs/pen). Pens within a block were assigned randomly to one of 4 dietary treatments fed in 3 phases. Dietary treatments consisted of a corn-soybean meal control (D0), a corn-soybean meal diet containing 20% DDGS fed throughout the study (D20), D20 and D0 diets alternated bi-weekly (D20SW), and a 40% DDGS diet alternated bi-weekly with the D0 diet (D40SW). There were 5 bi-weekly feeding periods with pigs assigned to D20SW and D40SW treatments starting and ending the trial consuming DDGS diets. There were no differences in ADG among treatments but D20SW pigs tended to have heavier final BW (P < 0.09) than D40SW pigs. Pigs assigned to D40SW tended to have lower ADFI (P < 0.07) than D20 pigs. Pigs assigned to D20SW had better gain efficiency (P < 0.05) than D20 pigs. At harvest, D0, D20, and D20SW pigs had heavier HCW (P < 0.01) than D40SW pigs but 10th rib backfat depth, loin eye area and percent carcass lean were not affected by treatment. These results suggest that the rapid inclusion and removal of 20% DDGS from growing-finishing pig diets will

not adversely affect pig performance or carcass characteristics but that at 40% DDGS inclusion levels it may reduce ADFI and HCW.

Table 1. Effects of rapid DDGS inclusion and removal on pig performance and carcass traits

Trait	D0	D20	D20SW	D40SW	PSE
Initial wt, kg	51.3	51.3	51.3	51.4	0.05
Final wt, kg	112.2 ^{xy}	112.2 ^{xy}	113.0 ^x	110.6 ^y	0.62
ADG, kg	0.87	0.87	0.88	0.85	0.009
ADFI, kg	2.70 ^{xy}	2.75 ^x	2.71 ^{xy}	2.63 ^y	0.029
G:F	0.323 ^{ab}	0.317 ^a	0.325 ^b	0.322 ^{ab}	0.002
HCW, kg	83.8 ^a	83.6 ^a	84.3 ^a	81.1 ^b	0.53
Dressing %	74.8	74.6	74.6	73.8	0.31

^{ab} Within a row means without a common superscript differ ($P < 0.05$).

^{xy} Within a row means without a common superscript differ ($P < 0.10$).

Introduction:

Pork producers and nutritionists want to use feed ingredients that will optimize pig performance at the lowest cost. Inclusion of DDGS in the diets for grower-finisher pigs may be economical at certain times, but not at other times. So, this puts the producer in the position of weighing the economic benefits of suddenly including economically priced DDGS in diets against any potential reductions in pig performance. We have very little direct evidence of the pig's response to frequent inclusion and removal of DDGS from the diet. If there are no changes in pig performance when switching between DDGS and non-DDGS diets, more pork producers may include DDGS in diets when it is economical, knowing that switching between DDGS and non-DDGS diets will not result in any reduction in pig performance.

The pig's feed intake response to DDGS in the diet is puzzling. Recently, researchers at the Universities of Illinois and Minnesota summarized 23 published studies reporting performance responses of growing-finishing pigs when their diets contained up to 30% DDGS. Average daily feed intake was increased in two experiments, reduced in 6 experiments, and not affected in 15 experiments when DDGS diets were fed. The reasons for this variable feed intake response to DDGS are unclear. There is limited evidence suggesting that alternating between DDGS and non-DDGS diets could decrease feed intake in growing-finishing pigs. Researchers at Kansas State University found that pigs preferred a corn-soybean meal diet over one containing DDGS when offered a side-by-side choice. However, the pigs' preference for the corn-soybean meal diet does not necessarily mean that feed intake and growth rate will be reduced if pigs are only offered a DDGS-containing diet. Other researchers have shown that a reduction in feed intake may occur when switching to bulky ingredients with high fiber content. Consequently, our research group conducted an experiment to determine the effects of switching between corn-soybean meal and corn-soybean meal-DDGS diets on pig performance and carcass quality of finishing pigs.

Objectives:

To determine the effects of bi-weekly switching between corn-soybean meal diets and diets containing 20 or 40% DDGS, compared to feeding corn-soybean meal or 20% DDGS diets continuously throughout the grower-finisher period, on growth performance and carcass composition.

Materials & Methods:

Crossbred pigs ($n = 216$; $BW = 51.3 \pm 3.1$ kg) were blocked by weight and assigned randomly to one of 24 pens (9 pigs/pen). Each pen was assigned to one of 4 dietary treatments. Dietary treatments consisted of

a corn-soybean meal control (D0), a corn-soybean meal diet containing 20% DDGS fed throughout the study (D20), D20 and D0 diets alternated bi-weekly (D20SW), and a 40% DDGS diet alternated bi-weekly with the D0 diet (D40SW). There were five two-week feeding periods with pigs assigned to D20SW and D40SW treatments starting and ending the trial consuming DDGS diets. Pigs were fed corn-soybean meal diets until the experiment started when pigs weighed about 110 lbs. Body weight of individual pigs was determined bi-weekly and used to calculate average daily gain. Pen feed disappearance was also determined on the same day that pigs were weighed and was used to calculate average daily feed intake. Body weight gain and pen feed disappearance were used to calculate gain:feed, and growth performance responses were statistically analyzed and compared among the four dietary treatments. Pigs were harvested in a commercial abattoir when they reached a final body weight of approximately 247 lbs. Hot carcass weight, 10th rib backfat depth, loin eye area and percent carcass lean were measured and responses were compared among dietary treatments.

Results:

Dietary treatments had no effect on average daily weight gain. With the exception of feed efficiency, growth performance was not different among pigs fed the control diet continuously, the 20% DDGS continuously or the 20% DDGS and control diets in an alternating pattern. For some reason, pigs fed the 20% DDGS diet continuously were not as efficient as those fed the same diet alternated with the control diet. Pigs switched on and off a 40% DDGS diet were lighter at the end of the 70-day study and produced a lighter carcass than pigs assigned to the other treatments because they tended to consume less feed. Dressing percentage and carcass fat-free lean percentage were not affected by dietary treatments.

Discussion:

Results of this study suggest that the frequent inclusion and removal of 20% DDGS from diets for finishing pigs will not adversely affect pig performance or carcass characteristics. We plan to conduct a similar experiment to determine if consistent responses are observed with lighter pigs. It appears that alternating 40% DDGS in and out of the diet may reduce feed intake and hot carcass weight of finishing pigs.