

**Title:** Sulfur Concentration in Distiller's Dried Grains with Soluble (DDGS) and Its Impact on Palatability and Pig Performance – **NPB #08-093**

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## Report from NCERC

### Scientific abstract

Because of the large supply of DDGS and the increasing costs of corn and soybean meal, it is expected that DDGS will be included in diets fed to animals in greater quantities in the future. However, potential risk factors, like high sulfur in DDGS, could reduce feed intake of diets containing DDGS, and also reduce animal performance. In this study, we have evaluated the extent of variation in sulfur concentration in DDGS based on a large collection of representative DDGS samples from the ethanol industry. For the first time, we have provided the typical ranges for sulfur in DDGS to the feed industry. Furthermore, we have determined the different forms of sulfur, i.e., amino acid bound sulfur, sulfates, in DDGS, as well as determined how much of each form of sulfur is intrinsic to DDGS or a result of the production process. In conclusion, we found that the intrinsic sulfur in DDGS, around 0.2 % (wt/wt, as received basis), is contributed from the organic sulfur, mainly cysteine and methionine in corn; while the major source of sulfur, the inorganic sulfur or sulfate in DDGS, comes from corn to ethanol production; and the inorganic sulfur level can vary from non-detected to 0.8 % or higher. The corn to ethanol production is the main factor controlling elevated sulfur level in DDGS.

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Contributing organizations for 2008 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 Corn Board, Nebraska Pork Producers Association, Inc., Ohio Pork Producers Council, Pioneer Hi-Bred International, Inc., Utah Pork Producers Association and the Wisconsin Pork Association.

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## Report from the University of Illinois

### Scientific abstract

Four experiments were conducted to investigate the effect of elevated S levels in diets on the feed palatability and the performance in weanling and grow-finishing pigs. In a 10-d feed preference experiment (Exp. 1), 48 weanling barrows ( $20.1 \pm 2.16$  kg BW) were grouped into 8 blocks by initial BW and allotted to 3 groups with 2 pigs per pen. Three diets were prepared: 1) the control diet based on corn and soybean meal, 2) the distillers dried grains with soluble (DDGS) diet containing 20% of DDGS, and 3) the DDGS + S diet. Sulfur was added as calcium sulfate to mimic the DDGS containing 0.9% S which was the highest level from the 35 DDGS sources in the United States. Two diets were provided in separate feeders in each pen: 1) the control diet and the DDGS diet, 2) the control diet and the DDGS + S diet, and 3) the DDGS diet and the DDGS + S diet. The feed preference for the DDGS diet and the DDGS + S diet versus the control diet was 35.2 and 32.6%, respectively ( $P < 0.05$ ). However, there was no feed preference between the DDGS diet and the DDGS + S diet. In a 28-d feeding experiment (Exp. 2), 90 weanling barrows ( $10.3 \pm 1.44$  kg BW) were allotted to 3 dietary treatments, 10 blocks based on BW, and 3 pigs per pen. The same diets as in Exp. 1 were used, and only 1 diet was provided to each pen. Pigs fed the control diet gained more weight (497 vs. 423 and 416 g/d;  $P < 0.05$ ) and had greater G:F (0.540 vs. 0.471 and 0.455;  $P < 0.05$ ) compared with the other two treatment groups. In another 10-d feed preference experiment (Exp. 3), 30 growing barrows ( $49.6 \pm 2.32$  kg BW) were allotted into 10 blocks and 3 treatment groups. The treatment structure and experimental procedures are the same as in Exp. 1 except that 30% of DDGS was included in the DDGS and DDGS + S diets. The feed preference for the DDGS diet and the DDGS + S diet compared with the control diet was 29.8 and 32.9%, respectively ( $P < 0.001$ ). However, the feed preference was unaffected by the additional S. In an 84-d feeding experiment (Exp. 4), 120 growing barrows ( $34.2 \pm 2.25$  kg BW) were used. The treatment structure and the experimental design were the same as in Exp. 2 except that 30% of DDGS was used and there were 2 phases. Pigs fed the control diet gained more weight (1,021 vs. 912 and 907 g/d;  $P < 0.05$ ) and had greater G:F (0.335 vs. 0.316 and 0.307;  $P < 0.05$ ) compared with the other 2 treatment groups and greater ADFI (3,054 vs. 2,887;  $P < 0.05$ ) than the DDGS group. The carcass weight was heavier (87.9 vs. 80.7 or 80.9 kg;  $P < 0.05$ ) in the pigs fed the control diet than in those fed the DDGS diet or the DDGS + S diet and heavier liver (1,860 vs. 1,661 g;  $P < 0.05$ ) and kidneys (372 vs. 331 g;  $P < 0.05$ ) than those fed the DDGS diet. The redness ( $a^*$ ) of the loin muscle was greater in the control group (8.62 vs. 7.39 than in the DDGS + S group. Overall, inclusion of 20 to 30% of DDGS in swine diets decreased the palatability and negatively affected the growth performance. But, the S concentration up to 0.34% in diets did not have detrimental effects on feed palatability, growth performance, carcass characteristics, or pork quality.

**Key words:** distillers dried grains with solubles, feed preference, growth performance, pigs, sulfur