DDGS IN POULTRY DIETS – DOES IT MAKE SENSE

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Distiller grains with solubles (DDGs) is not a new or novel feed ingredient. However, increased supplies of distiller's dried grains with solubles are anticipated throughout the US as a result of ethanol production and this has rekindled the interest in utilization of this corn co-product in animal feeds. DDGs as a feed ingredient has a moderate protein content. In the Midwest US, corn is the primary feed stock although other grains can be processed as well. In the dry mill production of ethanol, two products are produced – liquid solubles and grain residue. Each could be dried separately but are mixed together and dried to form DDGS as a dry ingredient. Some of the liquid solubles has been fed experimentally with acceptable results (Hunt et al., 1997) but usually the product is fed after drying. Newer production methods ("new generation plants") are thought to produce a higher quality ingredient.

A consideration for the use of this product or any alternative product is fairly similar to that of other ingredients. Information would be needed regarding its nutrient composition and variability, amino acid digestibility, amino acid balance, energy, mineral availability, maximum inclusion levels and cost relative to other ingredients. Unfortunately, there is limited recent research for this ingredient with modern strains of poultry.

Nutrient composition and variability

To assess composition of material from "new generation" processing plants, DDGs samples were collected from four ethanol processors in Minnesota over a period of time during spring, 2002 (Noll et al., 2003).

Four representative samples were obtained from each ethanol processor. Each sample was analyzed chemically for proximate components (protein, fiber, fat, ash, moisture), amino acids, and minerals. In addition, the samples were submitted to Dr. Parson's laboratory at the University of Illinois for *in vivo* determination of amino acid digestibility using cecatomized roosters. Samples are also being assessed for energy in turkeys using the True Metabolizable Energy (TME) assay developed by Sibbald.

Preliminary results indicate that nutrient content of the DDGs varies among sources but is relatively consistent within processing source. Sources were found to vary in proximate composition especially protein and fat content. Mineral content also varied among sources. Magnesium, sodium, potassium and phosphorus accounted for most of the inorganic component of the feed ingredient.

Nutrient profile and range in analytical values among DDGs as compared to NRC

Content		NRC, 1994
	%	
Protein	25.5-30.7	27.4
Fat	8.9-11.4	9
Fiber	5.4-6.5	9.1
Calcium	.017-.45	.17
Phosphorus	.62-.78	.72
Sodium	.05-.17	.48
Chloride	.13-.19	.17
Potassium	.79-1.05	.65
Amino acids (selected EAA)	% total amino acid	
Methionine	.44-.56	.6
Cystine	.45-.60	.4
Lysine	.64-.83	.75
Arginine	1.02-1.23	.98
Tryptophan	.19-.23	.19
Threonine	.94-1.05	.92

In the report presented by Cromwell and coworkers (1993), 9 different samples of DDGS were analyzed and tested in chick diets. A large range of lysine contents were noted (.43 to .89%). Chick responses to inclusion of these same samples (20%) in isonitrogenous and isocaloric diets ranged from 63 to 84% of the corn-soy-starch control. Samples higher in lysine tended to perform better but some samples did not follow this pattern.

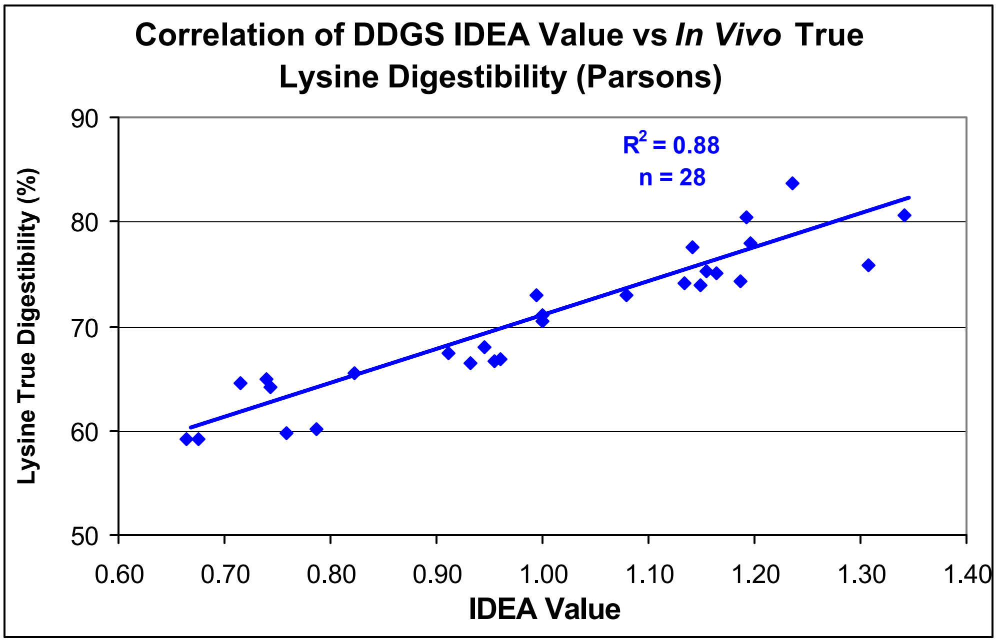
As distiller grains undergo heating to produce the dried product, concern exists over amino acid digestibility especially for heating of lysine in the presence of sugars. Indeed the limited previously literature citations indicates poorer availability of lysine. Combs and Bossard (1969) found lysine availability to range from 71-93% by chick growth assay. Parsons et al. (1983) found slightly lower availability of 66% by chick growth assay. Lysine digestibility with roosters was found to 82%. Other sources also assign a low digestibility to DDGs.

In the survey conducted, digestibility of several essential amino acids were affected, in particular that of lysine, threonine and cystine. Digestible lysine was in general much improved over previously published values in three of the four sources. The data indicate that while there are product differences among sources the product is relatively consistent for each source.

Digestible Amino Acid Content and range among DDGs

Amino acids (selected EAA)	% Digestible amino acid	Digestibility Coefficient (%)
Methionine	.35-.53	85.6-90
Cystine	.28-.57	66.3-85
Lysine	.37-.74	59.1-83
Arginine	.73-1.18	80.5-90
Tryptophan	.14-.21	76.4-87.4
Threonine	.61-.92	66.8-80.7

Digestibility as determined by *in vivo* methods can be quite costly and time consuming. Lysine level, or other *in vitro* methods such as color or the Novus "IDEA" system can be used to make quality determinations much more quickly. DDGs samples with high digestible tended to have proportionally higher lysine content compared to samples low in amino acid digestibility. Ergul et al. (2003) found that sample color in terms of lightness and yellowness was correlated with lysine digestibility (r^2=.71 and .74, respectively). Using immobilized digestive enzyme assay (IDEA) system, a high correlation was also found between lysine digestibility and IDEA values (r^2=.88) (C. Schasteen, personal communication, 2004).



The higher digestibility of some sources of DDGs for lysine can definitely add value to the DDGs. An economic analysis of turkey grower diets containing DDGs with either lower or higher lysine digestibility (60% vs. 78%) resulted in an opportunity cost of 50 cents greater for the DDGs with hig her digestibility. Different scenarios of corn and SBM prices were used.

Influence of digestible lysine content on value of DDGs ($/cwt)

Ingredient and price ($/cwt)	DDGs – Low digestible lysine	DDGs – High digestible lysine
Corn, 3.10	4.28	4.78
Corn, 3.50	4.54	5.00
Corn, 5.30	5.70	6.02
SBM, 8.25	4.54	5.00
SBM, 8.70	4.72	5.21

Recent Feeding Trials

Turkeys. Three trials have been conducted at the University of Minnesota incorporating DDGs into market tom grow finish diets. A summary of the results are given in the following table:

Market Tom Trials-Grow/Finish Diets
(University of Minnesota)

Trial*	Trt	DDGs,%	BW, lb	F/G
1	Control	0	41.7	2.44
	DDGs	12-8	41.9	2.48
2	Control	0	42.3	2.64
	DDGs	11-8	42.3	2.65
3	Control	0	40.6	2.67
	DDGS	10	40.4	2.63

*From Noll, University of Minnesota; Trial weeks of age; 1=5-19 wks; 2=8-19 wks; 3=11-19 wks

In all three studies, comparable performance in terms of body weight and feed conversion was found for the DDGs test diets in comparison to a corn-soy-meat based diets with formulation conducted using digestible amino acids. In contrast, Roberson (2003) found some higher levels of DDGs depressed growth in market turkey hens as level of inclusion increased to 27%. However, at inclusion levels of less than 10%, performance comparable to the control was obtained.

Broilers. Waldroup et al (1981) conducted a study examining the influence of adjustment for dietary energy content with supplemental fat. DDGs was included to 25% of diet for broilers. When adjusted for lysine and energy level, performance was not affected. Without adjustment for energy, growth was maintained but feed conversion decreased. Caloric intake per gain was similar across all treatments. A more recent study by Dale and Batal (2003) indicated that 6% inclusion in broiler starter feeds and up to 12% in grower feeds could be used without affecting live performance.

Laying hens. Dale and Batal (2003) also examined inclusion of 15% DDGs in laying hen diets. A lower number of eggs were found to 34 wks of age for hens fed the 15% DDGs although it was thought that this effect was due to the lighter weight of the pullets coming into lay in the summer as no differences were noted in egg numbers between the control and DDGs treatments thereafter.

In summary, DDGs was found to be an acceptable source of protein in diets for poultry at moderate levels of inclusion. Diets should be formulated taking into consideration amino acid digestibility, appropriate metabolizable energy value and available phosphorus contributions. More information regarding DDGs can be found at the following University of Minnesota website: http://www.ddgs.umn.edu/.

Acknowledgments

Thanks to the MTGA Nutrition subcommittee members for their suggestions and technical expertise and to the staff at the Rosemount Agricultural Experiment Station for their assistance and care of the flock. The project was partially funded by the Minnesota Turkey Research and Promotion Council, Heartland Lysine, MN Ethanol Distillers, and Minnesota Corn Growers Association. Central Bi-Products, FMC, Pfizer and Elanco also donated supplies to the project.

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