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Nutritional value of ethanol co-product evaluated for poultry

ETHANOL production co-products have become a staple of the animal feed industry. Most notable among these are variations of corn dried distillers grains plus solubles (DDGS) products.

The Renewable Fuels Assn. reported that 40 million metric tons of DDGS products were produced for the animal feed industry in 2015. The poultry industry was reported to have used 8% (3.2 mmt) of the total.

There is considerable interest in producing ethanol industry co-products that have increased nutritional value for poultry.

Front-end fractionation and back-end fractionation are two of the common processing methods used. In front-end fractionation, the germ and fiber are removed prior to fermentation to yield higher-protein, reduced-fiber ethanol co-products. In back-end fractionation, the goal is similar, but the fractionation is done post-fermentation.

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Bottom Line

with
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Dr. Carl Parsons of the department of animal sciences at the University of Illinois presented a paper on the nutritional value of novel feed ingredients at the Minnesota Nutrition Conference.

One of the novel products Parsons discussed was produced by back-end fractionation (after fermentation) that's designed to maximize recovery of the protein fractions from the stillage.

The specific product tested (Still Pro 50) was produced using a process developed by Fluid Quip Process Technologies. The final product is said to contain approximately 25% brewers yeast and 25-30% corn protein, with the remainder made up of fine fiber, carbohydrates, oil and minerals. The product was analyzed at approximately 50% protein and falls within the American Association of Feed Control Officials' definition of grains distillers yeast (GDY).

Product evaluation

The GDY product was evaluated for true metabolizable energy corrected to zero nitrogen balance (TMEn) and standardized amino acid digestibility (SAAD) using precision-fed rooster assay methods. The TMEn values were determined using conventional single-comb white Leghorn roosters. The SAAD values were determined using cecectomized roosters. Parsons et al. (1992) described the details of the procedures.

The results of the HD-DDG evaluation are shown in the Table. The first grouping of numbers shows the values obtained for TMEn, crude protein and a selection of essential amino acids. The second grouping of numbers shows the SAAD coefficients. The third grouping of numbers shows the concentration of digestible amino acids in the ingredient.

In the Table, I have included two other ingredients — DDGS and soybean meal — that were not a part of this experiment but are useful for comparison. The DDGS is the average result of a survey of conventional DDGS products based on samples collected from a number of commercial plants (Batal and Dale, 2006). The soybean meal is the result of

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Energy and amino acid values for GDY and comparison ingredients

	GDY*			DDGS**			Soybean meal***		
Nutrient	Total	Dig. coeff.	Dig. conc.	Total	Dig. coeff.	Dig. conc.	Total	Dig. coeff.	Dig. conc.
TMEn, kcal	3,372	—	—	3,279	—	—	2,796	—	—
Crude protein, %	53.0	—	—	31.4	—	—	48.4	—	—
Methionine	1.05	92.41	0.97	0.54	86.8	0.47	0.68	91.2	0.62
Cysteine	0.90	86.63	0.78	0.56	73.9	0.41	0.65	77.8	0.51
Lysine	2.22	83.62	1.86	0.71	69.6	0.49	3.06	87.5	2.68
Threonine	2.06	86.44	1.78	0.96	74.5	0.72	1.87	85.9	1.61
Valine	3.08	86.90	2.67	1.33	79.5	1.06	2.37	88.4	2.09
Arginine	2.49	94.02	2.34	1.75	74.8	1.31	3.44	91.6	3.15
Isoleucine	2.24	90.02	2.00	0.97	83.3	0.81	2.23	90.8	2.02
Tryptophan	0.45	86.88	0.38	0.96	87.9	0.84	—	—	—

*GDY nutrient values are on a dry matter basis.
**Conventional DDGS from Batal and Dale, 2006. TMEn and crude protein are on a dry matter basis, and amino acid values are on an as-fed basis.
***Dehulled soybean meal; results were from another experiment for comparison only. TMEn is on a dry mater basis, and crude protein and amino acid values are on an as-fed basis.

a sample of high-protein dehulled soybean meal developed in a recent experiment (not part of the GDY experiment) in the Parsons laboratory.

The TMEn value of GDY was determined to be 3,372 kcal on a dry matter basis. This is virtually the same as the value of 3,279 kcal determined for DDGS and significantly higher than the 2,796 TMEn value determined for a sample of soybean meal. Energy is the most expensive nutrient in most poultry feeds. GDY is a potential replacement for soybean meal that comes with a higher level of energy.

The analyzed protein level of GDY, at 53%, was nearly twice the level of protein found in conventional DDGS, which was 31.4%.

As expected, the amino acid levels in GDY were approximately twice the levels present in DDGS. The SAAD coefficients for GDY were consistently higher than the comparable levels found for conventional DDGS and were actually higher than many of the digestibility values determined for the soybean meal sample.

The combination of high levels of total amino acids and high digestibility coefficients resulted in the ingredient concentration of digestible amino acids being quite favorable compared with the soybean meal sample — with the exception of lysine.

Soybean meal is uniquely high in lysine content and perhaps contains more lysine than any other ingredient, save fish meal. Soybean meal — at 3.06% total lysine and 2.68% digestible lysine — contains about 50% more lysine than GDY. Also, lysine is typically the second-limiting amino acid in poultry feeds.

The values for the amino acids methionine and cysteine in GDY (0.97% and 0.78%, respectively) compare quite favorably with the relevant values for soybean meal (0.62% and 0.51%). This observation is particularly important, because the sulfur amino acid requirement is almost always the first-limiting amino acid in poultry diets.

Parsons concluded that, overall, the results of the current study indicate that the nutritional value of this GDY is definitely superior to conventional DDGS that is typically produced from corn. The nutritional value of this GDY also compares favorably with high-protein soybean meal.

The GDY product tested in this research study is more than an experimental material for consideration in the future. This product is currently produced in two ethanol plants in the U.S., with more production expected in 2018.

A copy of the proceedings of the 2017 Minnesota Nutrition Conference may be requested by contacting Bonnie Rae at bjrae@umn.edu.

The Bottom Line

This research shows that the GDY tested is superior in nutritive value to conventional DDGS and should be competitive with high-protein soybean meal in poultry diets. Growth performance research will be very helpful. Economics will be the final determinant.

References

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