Chapter 20

Use of Reduced-Oil DDGS in Poultry Diets

Introduction

"Typical" DDGS contains 10 to 12% crude fat and has approximately 85% the energy value of corn for poultry. Most of the energy in DDGS is derived from the crude fat content in poultry because birds have less fiber fermentation in the lower gut than swine, resulting in lower energy utilization of high fiber feedstuffs. Therefore, the impact of oil extraction from DDGS will have the greatest impact on apparent metabolizable energy (AME) and true metabolizable energy (TME) content for poultry compared to other species, and depending on the extent of oil removal in DDGS, may result in substantially lower dietary inclusion rates or elimination from the diet.

Effects of feeding reduced-fat DDGS (RF-DDGS)

One study has been published related to the effects of feeding RF-DDGS on AME_n content in broilers (Rochelle et al., 2011). These researchers evaluated 15 diverse corn co-products, including DDGS and RF-DDGS, from wet milling and dry-grind ethanol plants. The nutrient composition of 5 "typical" DDGS sources and 1 RF-DDGS evaluated in this study are shown in **Table 1**.

Table 1. Nutrient content (dry matter basis) of 5 DDGS sources and reduced-fat DDGS (RF-DDGS).

	DDGS 1	DDGS 2	DDGS 3	DDGS 4	DDGS 5	RF-DDGS
Dry matter, %	86.59	93.18	89.13	90.25	91.20	87.36
GE[1], kcal/kg	5,434	5,314	5,547	5,375	5,174	5,076
AME_n[2], kcal/kg	2,685	2,628	3,098	2,593	2,903	2,146
Crude protein, %	31.94	29.62	29.49	29.65	26.48	34.74
Crude fat, %	10.16	11.45	11.71	10.89	11.52	3.15
Crude fiber, %	7.56	7.05	7.95	7.76	7.01	8.69
NDF, %	40.12	34.61	33.41	40.13	27.72	50.96
ADF, %	14.42	11.25	8.62	10.55	9.75	15.82
TDF, %	35.69	30.34	35.90	38.14	32.69	37.20
Starch, %	6.24	7.85	4.94	3.47	3.30	3.04
Cellulose, %	11.72	10.64	8.21	10.12	8.04	12.72
Lignin, %	3.16	1.21	1.00	1.06	2.29	3.49
Ash, %	4.46	4.16	5.41	4.43	4.48	5.16

[1]GE = gross energy.

[2]AMEn = apparent metabolizable energy corrected for nitrogen.
[3]NDF = neutral detergent fiber.
[4]ADF = acid detergent fiber.
[5]TDF = total dietary fiber.

Gross energy (GE) content of the 5 DDGS sources ranged from 5,174 to 5,547 kcal/kg and averaged 5,369 kcal/kg. The GE content of RF-DDGS was 5.5% lower (5,076 kcal/kg) than the average GE content of DDGS, but was poorly correlated (r = 0.21, P = 0.44) with AME_n content. The AME_n content of the DDGS sources ranged from 2,593 to 3,098 kcal/kg with an average of 2,781 kcal/kg, whereas the AME_n for the RF-DDGS was 2,146 kcal/kg. Therefore, although oil extraction reduced the GE content by only 5.5%, AME_n content of RF-DDGS was reduced by 22.8%, and was due to not only a 72% lower fat content, but also a 45% increase in NDF content and a slight increase (11%) in ash content compared to the average of the 5 DDGS sources evaluated in this study.

Because of the high variability in crude fat and NDF content relative to AME_n content in distiller's co-products, one cannot simply assume that a 1 percentage unit decrease in crude fat content will accurately estimate its impact on AME_n content. In fact, of all nutrients considered, hemicellulose had the strongest correlation with AME_n (r = -0.85, P = 0.01), followed by NDF, TDF, and crude fiber (r = -0.83, -0.77, and -0.75 respectively, P = 0.01). Hemicellulose is determined by difference between NDF and ADF in this study. Since hemicellulose is the primary fiber component in NDF, TDF, and crude fiber found in corn co-products, it is not surprising that it was the most predictive of AME_n content. Correlations of other fiber measures (ADF, r = 0.43, P = 0.11; cellulose, r = -0.44, P = 0.10) were low and not significant. Furthermore, GE, starch, and crude fat were poorly correlated with AME_n (r = 0.21, 0.45, and 0.39, respectively).

Therefore, these researchers developed prediction equations to estimate AME_n content from nutrient composition of a diverse group of distillers co-products. Using stepwise regression analysis, AME_n can be predicted (R^2 = 0.89, SEM =191, P < 0.01) as follows:

AME_n (kcal/kg of dry matter) = 3,517 – (33.27 x % hemicellulose, dry matter basis)+ (46.02 x % crude fat, DM basis) – (82.47 x % ash, DM basis)

Until more definitive data and prediction equations are published on the effect of RF-DDGS on AME_n content in poultry, this equation is the best prediction available to estimate these effects, but it has not been validated.

References:

Rochelle, S.J., B.J. Kerr, and W.A. Dozier. 2011. Energy determination of corn co-products fed to broiler chicks from 15 to 24 days of age, and use of composition analysis to predict nitrogen-corrected apparent metabolizable energy. Poul. Sci. 90:1999-2007.