WHAT'S NEW SINCE SEPTEMBER 2005 IN FEEDING DISTILLERS CO-PRODUCTS TO POULTRY[a]

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INTRODUCTION

Since 2005, concerns regarding the use of DDGS (distillers dried grains with solubles) still quite often remain that of variability in nutritional and physical characteristics and quality of the product and recommendations for incorporating DDGS into poultry diets. Thus studies were conducted to assess the effect of varying solubles (syrup) addition to the wet grains (mash) on the nutrient composition of the dried product. Further research was conducted to examine the use of DDGS in market turkey diets with and without animal by product addition.

DDGS CHARACTERISTICS AND POULTRY FEEDING VALUE

Several studies have indicated that variability in composition and quality exists in DDGS. An earlier study indicated that while variation exists among sources or plants, product is relatively consistent when from a single source (Noll et al., 2003). Quality as assessed by amino acid digestibility especially for lysine also is variable. Table 1 summarizes information from three different publications regarding true lysine digestibility as determined in cecectomized roosters. On average, true digestibility for lysine was in excess of 70% but some individual samples showed low digestibility.

Table 1. Lysine content and digestibility of DDGS

Source	No. of Samples	Mean Lysine Content (%)		Mean Lysine Digestibility Coefficient (%)	
		Average	Range	Average	Range
Ergul et al. 2006[1]	20	.73	.59-.89	72	59-84
Batal and Dale 2006[2]	8	.71	.39-.86	70	46-76
Fastinger et al. 2006[1]	5	.64	.48-.75	76	65-82

[1]As fed basis [2] Adjusted to 86% DM

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Likewise, TMEn were also evaluated in these studies. On a 86% DM basis, TMEn ranged from 2490 to 3190 kcal/kg with an average of 2820 for the 17 samples (Batal and Dale, 2006) as determined with conventional roosters. The authors attempted to develop a predictive equation for TMEn based on fat, fiber, protein, and ash content.

Fat content was the best predictor of TMEn content but the overall R2 was quite low (R^2=.29). Adding fiber, protein, and ash to regression model moderately improved the prediction equation (R^2=.45). In the study by Fastinger et al. (2006), on an as fed basis, TMEn ranged from 2484 to 3014 kcal/kg with an average of 2871 for the five samples. In this study, the sample with the lowest energy value was associated with the sample having the poorest amino acid digestibility as well.

Many things can contribute to this source of variability such as corn composition, modifications of the nutrients during ethanol production, such as corn processing, solubles addition, and drying conditions. Variable solubles addition to the wet grains prior to drying could effect the nutrient composition of the dried product and perhaps change the dynamics of the drying process to effect product quality. To examine the effect of the solubles addition, a pilot study was conducted in cooperation with an ethanol plant in Minnesota.

Batches of corn distiller dried grains were produced with varying levels of solubles (syrup) added back to the wet grains (mash). The batches produced contained syrup added at approximately 0, 30, 60, and 100% of the maximum possible addition of syrup to mash. Actual rates of syrup addition were 0, 12, 25, and 42 gal/minute. The different combinations of mash and syrup were dried at the plant with a lag of 60 minutes in between adjustments for the different rates of syrup addition. Dryer temperature decreased with the decrease in rate of solubles of addition. Samples of each lot of material were taken and were chemically analyzed. Digestible amino acids were determined in cecectomized roosters and true metabolizable energy (TMEn) in intact young turkeys. Regression analyses and correlation coefficients (Pearson) were conducted to determine the extent of the relationship between the level of solubles added and the resulting nutrient content. The results indicate that the level of solubles addition has most of its effect on the following components (Table 2). Physical attributes were affected in particular particle size and color of the dried product. Particle size was greatly affected with larger and more variable particle size with the highest level of solubles addition. The larger particles ("syrup balls") were readily apparent in the 100% batch. Content of fat and ash increased with solubles addition. The TMEn content increased with solubles addition. Mineral content, especially for magnesium, sodium, phosphorus, potassium, chloride, and sulfur increased as the level of solubles addition increased. Protein and amino acid content showed very little change in the various products. True amino acid digestibility coefficients of the essential amino acids tended to be negatively correlated with solubles addition. The results indicate that solubles addition has the largest effect on particle size, color, and; contents of fat (and thus TMEn) and minerals.

Table 2. Solubles addition and characteristics of the resulting DDGS.

	Solubles Addition Rate (gal/min)				Statistics	
	42	25	12	0	Correlation (Pearson)	Pvalue
Product Characteristics						
Color (CIE Scale)						
L	46.1	52.5	56.8	59.4	-0.98	0.0001
a	8.8	9.3	8.4	8.0	0.62	0.033
b	35.6	40.4	42.1	43.3	-0.92	0.0001
Moisture (%)	13.83	10.74	9.75	9.52	0.93	0.06
Nutrient Characteristics (%,DM basis)						
Crude fat	10.53	9.22	9.14	7.97	0.96	0.036
Protein	31.98	32.46	32.65	31.96	0.03	NS
Crude fiber	6.50	10.08	7.76	9.17	-0.51	NS
Ash	4.62	3.72	3.58	2.58	0.97	0.033
TMEn, kcal/kg	3743	3002	2897	2712	0.94	0.06
P, ppm	9116	7669	6636	5315	0.99	0.002
Lys	1.04	1.09	1.05	1.04	0.02	NS
Met	0.62	0.59	0.64	0.63	-0.13	NS
Cys	0.62	0.53	0.61	0.61	0.16	NS
Thr	1.20	1.20	1.22	1.20	-0.18	NS
Digestibility Coefficients (%)						
Lys	75	69.7	76	78.2	-0.90	NS
Met	87.3	86.3	88.6	90.9	-0.92	NS
Cys	80.3	80.7	87.6	87.2	-0.95	NS
Thr	77.3	80.5	83.2	85.9	-0.99	0.0197
Arg	88.5	86.7	90.7	92.1	-0.99	0.07

INCORPORATION OF DDGS INTO MARKET TURKEY DIETS

Previous studies have indicated that 10% DDGS could be incorporated into corn-soy diets containing minimal amounts of animal byproduct (Noll et al. 2003) into grow/finish diets for heavy toms. As prices or supplies permit, higher levels may be appropriate assuming performance doesn’t suffer. Feeding levels of 15 and 20% resulted in performance similar to the control (Noll et al., 2004). However, in a subsequent feeding trial, conducted such that the trial finished in early summer, growth of turkeys fed 20% DDGS was slightly depressed in comparison to the control (Table 3) (Noll et al., 2005).

Table 3. Performance of market tom turkeys when fed diets containing DDGS

Treatment	Body weight at 19 wks (kg)[1]	Feed:Gain 6 to 19 wks of age
1. Corn Soy Control	17.46	2.53
2. With 10% DDGS	17.35	2.52
3. With 20% DDGS	17.11	2.55

[1]Contrast testing indicated Treatment 3 to be different from the control (P<.05).

Another feeding trial was conducted to examine different inclusion levels of poultry byproduct meal (PBM) and DDGS and their combined effect on market tom performance during 5-19 wks of age (Noll et al., 2006). Large White male turkey poults (Nicholas strain) were randomly assigned to pens (10/pen) at 5 wks age and fed one of the following diet treatments (T): 1. Corn and soybean meal control; 2. As T1 with PBM (8%); 3. As T1 with PBM (12%); 4. As T1 with DDGS (10%); 5. As T1 with DDGS (20%); 6. As T 2 and T4; 7. As T2 and T5; 8. As T3 and T4; and, 9. As T3 and T5. Diets were formulated using digestible amino acids. Diet protein level was established by using intact protein to meet the digestible NRC thr at 100% of the NRC recommendation (thr). All diets were supplemented as needed with lysine and methionine to meet the specific NRC recommendations for these amino acids. The ratio of calcium: phosphorus was maintained at 2:1 to accommodate the higher levels of phosphorus in the diets containing high levels of PBM and DDGS. Each diet was fed to 10 replicate pens. The experimental design was a completely randomized block design with a factorial arrangement of PBM and DDGS inclusion levels. At 19 wks of age (Table 4), dietary treatment significantly affected 19-wk body weight and feed efficiency (5-19 wks) (P<.001).

Table 4. Market Tom Performance and Inclusion of Alternative Protein Sources

			Body Weight (lbs)					Feed/Gain	
Trt #	Diet Description		11 wks		19 wks			5-19 wks	
1	Corn-Soy Control		19.12	a	44.49	a		2.50	cd
2	As 1 + 8% PBM		18.58	b	43.95	ab		2.47	cd
3	As 1 + 12% PBM		18.35	bc	43.77	abc		2.46	d
4	As 1 + 10% DDGS		19.20	a	44.47	a		2.51	bc
5	As 1 + 20% DDGS		18.91	a	44.41	a		2.51	c
6	As Trt 2 & 4		18.58	b	43.99	ab		2.50	c
7	As Trt 2 & 5		17.87	d	42.85	c		2.56	a
8	As Trt 3 & 4		18.06	cd	43.56	abc		2.45	d
9	As Trt 3 & 5		18.06	cd	43.09	bc		2.55	ab
	Statistics								
	Treatment P value		0.0001		0.0001			0.0001	
	Treatment LSD (P<.05)		0.34		0.96			0.05	

The body weight of the corn-soy control diet (T1) averaged 20.18 kg. Diets containing PBM (8 or 12%) or DDGS (10 or 20%) were not significantly different from the control. BW of turkeys fed diets containing PBM (8 or 12%) in combination with 20% DDGS was less than that of the control by 3.3%. A significant interaction existed for inclusion of PBM and DDGS (P<.02) for feed efficiency. Feed/gain of turkeys fed diets containing PBM (8 or 12%) or DDGS (10 or

20%) were not significantly different from the control. However, the feed/gain increased for turkeys fed diets containing PBM (8 or 12%) in combination with 20% DDGS and were significantly different from the control by 5 to 6 points.

In summary, some of the nutrient variability in DDGS may be due to addition of different levels of solubles. Feeding trials indicated that in comparison to a corn-soy control diet, addition of PBM at 8 or 12% depressed body weight, primarily as a result of depressed gains to 11 wks of age. In comparison to a corn-soy control diet, addition of 10 or 20% DDGS resulted in similar performance. In comparison to a corn-soy control diet, addition of both PBM and 20% DDGS resulted in poorer performance, although performance of birds in the trial was very acceptable regardless of treatment. Thus, performance of turkeys fed 20% DDGS diets was not different from the control except when used in combination with high levels of PBM.

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