PREDICTION OF AMINO ACID DIGESTIBILITY IN DISTILLERS DRIED GRAINS WITH SOLUBLES, BY COLOR, ACID INSOLUBLE CRUDE PROTEIN, SOLUBLE PROTEIN, AND FLUORESCENCE

P. E. Urriola[1], H. H. Stein[2], D. Hoehler[3], C. Pedersen[4], G. C. Shurson[1]
[1]Department of Animal Science University of Minnesota [2]Department of Animal Science University of Illinois [3]Degussa Corp., Kennesaw, G.A.[4] Danisco Animal Nutrition, Marlborough, Wiltshire, U.K.

Total lysine content of distillers dried grains with solubles (DDGS) is quite variable among sources (CV > 15%; Spiehs *et al.,* 2002; Goodson and Fontaine, 2004). Digestibility of nutrients in corn DDGS has also been shown to vary among sources, especially lysine standardized ileal digestibility (SID) (Stein *et al.,* 2006; Fastinger *et al.*, 2006). Color appears to be a reasonable predictor of lysine digestibility as reported by Cromwell *et al.* (1993) and Fastinger and Mahan (2006). However, those studies evaluated only a limited number of DDGS sources. The objective of this study was to develop and evaluate a large data set of corn DDGS SID values and correlate amino acids digestibility to selected nutritional and physical characteristics. The total data set consisted of SID amino acid values from 37 DDGS sources. All DDGS samples were analyzed for neutral detergent fiber (NDF), acid detergent fiber (ADF), acid insoluble crude protein (ADICP), soluble protein (SolCP), particle size (PS), and starch (S). Color was analyzed by Minolta (M) colorimeter model CR-310 and a Hunter-Lab (H) spectrometer model Colorflex 45/0. Front-Face Fluorescence (FFF) was determined with a spectrometer model Aminco Browmann II. Linear regression was performed to correlate crude protein and amino acids digestibility of the 37 sources with nutritional and physical characteristics previously described. Significance level was set at $P < 0.05$. There was a broad range in DDGS lightness (37 darkest and 63 lightest) as measured by L* with M, and L* ranged from 40 and 65 as read by H. Also, yellowness (b*) ranged from 21 to 47 for M and from 25 to 48 for H. The range in redness (a*) in DDGS as measured with M was lower (8 to 12) than those read by H (10 to 13). Samples in this data set were lighter and more yellow than those evaluated by Fastinger and Mahan (2006) and Batal and Dale (2006). Digestible CP (DCP), lysine (DLys), threonine (DThr), and tryptophan (DTrp) were not significantly correlated with any of the color parameters (L*, a* and b*) in M or H ($r^2 < 0.40$). Moreover, predictions did not improve as other analyzed characteristics (NDF, ADF, ADICP, SolCP, Ash, and S) were added into the model for M or H. When the regression model combined total CP content and M a*, prediction of DCP were better than CP or color alone ($r^2 = 0.80$). The combination of CP with M L*, a* and b* was correlated to DTrp ($r^2 = 0.61$). Minolta a* alone with CP were less correlated to DLys and DThr ($r^2 = 0.44$ and 0.59 respectively). In similar fashion, Hunter L* improved correlations when combined with CP ($r^2 = 0.78$). Digestible tryptophan was correlated to H parameters L*, and b* ($r^2 = 0.57$). Digestible lysine was correlated with H a* and b* ($r^2 = 0.50$). When color was expressed as optical density (400nm to 700nm), DCP and DLys were reasonably predictable ($r^2 = 0.81$, and 0.75 respectively), but digestible DThr and DTrp were poorly correlated ($r^2 = 0.67$ and 0.38 respectively). Digestible CP, DLys, DThr, and DTrp were correlated with FFF ($r^2 = 0.94$, 0.98, 0.98 and 0.99 respectively). Color expressed as L*, a* or b* reduced the ability to predict digestible amino acid content in DDGS, but it was improved by expressing it as optical absorbance. Predictions were higher when crude protein is used among independent variables.

Fluorescence was the only method capable of predicting digestible amino acid content as single measurement.