Prediction of amino acid digestibility in distillers dried grain with solubles from crude protein, optical density and fluorescence

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Standardized ileal digestibility values of CP and AA from 36 samples of distillers dried grain with solubles (DDGS) and 1 sample of distillers dried grain (DDG) were obtained from 5 in vivo experiements. Thirty four of the samples of DDGS were produced from corn (C), 1 sample was produced from sorghum, and 1 sample was produced from a corn-sorghum blend. The optical density (OD) of each sample was measured using a spectrophotometer color-Flex (HunterLAB) from 400 to 700 nm. Front face fluorescence (FFF) intensity was determined at 360 nm excitation and recorded from 380 to 600 nm using a spectrometer (Aminco Browman II, Thermo Electron Corporation). Principal component (PC) analyses were performed on the spectral data to create a new data set in which the explanatory variables were independent. The OD had highest correlation with DLys at 410 nm (r = 0.50) and lowest at 700 nm (r = 0.42). The FFF intensity had highest correlation with Dlys from 400 to 460 nm (r = 0.29). The OD predicted ($P < 0.05$) digestible Lys, Met, Thr and Trp (R^2 = 0.86, 0.69, 0.73, and 0.88, respectively) from all 37 samples of distillers by-products. However, digestible Lys and DThr were predicted ($P < 0.05$) with greater accuracy from OD when only C sources were considered in the model (R^2 = 0.97 and 0.92, respectively), but digestible Trp and Met predictions were slightly lower (R^2 = 0.77 and 0.30; $P < 0.05$) if only C sources of DDGS were used. Also, CP was included in the prediction models along with OD data for all distillers by-products (R^2 = 0.94, 0.89, 0.73, and 0.88 for Dlys, Dmet, Dthr, and Dtrp, respectively, $P < 0.05$). The FFF accurately predicted digestible Lys, Met, Thr, and Trp (R^2 = 1, 0.97, 0.96, 1, respectively) in all 37 samples, but regression equations using FFF required 9 to 15 principal components. Prediction of digestible AA content in DDGS is feasible from OD with reliable accuracy for digestible CP, Lys, and Trp while addition of CP into the model improves predictions of other AA. The FFF was the most accurate method for predicting digestible CP and AA of DDGS.

Key words: amino acid, digestibility, DDGS, color, fluorescence