

Supply of Feed Protein and Bioavailable Lysine by Corn Distiller Grain in the Intestine

Y. L. Li¹, W. Z. Yang¹, and L. Armentano²

¹Research Center, Agriculture and Agri-Food Canada, PO Box 3000, Lethbridge, AB T1J 4B1, Canada, ²University of Wisconsin, Madison, WI, 53706-1284, USA

¹Email: yanling.li@agr.gc.ca

Corn-based distiller grains (DG) from ethanol plant are derived either from fermentation of whole kernel (traditional) or only endosperm (fractional). A fractionation process by physically separating corn grain into bran, germ and endosperm prior to fermentation of the endosperm increases fermentation efficiency and market opportunities for by-products. The objective of this study was to investigate whether intestinal digestibility of ruminal undegraded protein (RUP) and bioavailable lysine varies with source of DG and heating process during drying DG in the plant.

Eleven DG samples with 7 traditional, 3 fractional and 1 mixture of bran/syrup were evaluated. Rumen residues were produced by incubating nylon bags in the rumen of three lactating dairy cows for 18 h. The bag residues after the rumen incubation were then exposed to a pepsin-pancreatin enzymatic solution to mimic digestion in the small intestine. Bioavailable lysine from the pepsin-pancreatin enzyme solution after 48 h of incubation was quantified using a microbiological microtiter plate test kit (VitaFast® L-Lysin, R-Biopharm AG, Damstadt, Germany). Protein content was 58% higher for fractional DG (52% dry matter) than for traditional DG (32% dry matter). The RUP of DG ranged from 50 to 81% of CP with the lowest 50%, the highest 81% and the medium 66%, respectively, for endosperm DGS, endosperm DG and traditional DGS. In vitro intestinal digestibility of RUP was generally high (> 80%) and was similar among the DG samples except for one traditional DG and the mixture of bran/syrup that had the digestibility of 76% and 62%, respectively. Additionally, the drying process (heating vs. freeze-drying) had minimal effect on the intestinal digestibility of RUP. Bioavailable lysine (% of dry matter) varied among DG for being the lowest with bran/syrup (0.14), the highest with endosperm DG (1.62), and the medium with traditional DG (0.90).

Implication: The protein content and RUP proportion of DG can be very different, whereas intestinal digestibility of RUP is generally similar among DG products. The protein content and RUP proportion are key needing to be considered to estimate the ultimate availability of feed protein by feeding DG to dairy cattle.