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Abeysekara, S.

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Spectroscopic impact on protein and carbohydrate inherent molecular structures of barley, oat and corn combined with wheat DDGS

Saman Abeysekara, Daalkhaijav Damiran and Peiqiang Yu

Department of Animal & Poultry Science, University of Saskatchewan

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A nutrient supply from a concentrate feed is a major factor to compose an effective total mixed ration for cattle. Appropriate ratio of energy and protein is the foundation for an effective concentrate feed. The objectives of this experiment were to use non-invasive and non-destructive infrared molecular spectroscopy as a novel approach to explore and identify protein and carbohydrate molecular structure spectral features of DDGS (dried distillers grain solubles from wheat (*Triticum aestivum*), and its combinations with barley (*Hordeum vulgare*), corn (*Zea mays*) and oat (*Avena sativa*). The spectral parameters assessed in this study included amides, α -helix and β -sheet, lignin, cellulosic compounds and non-fiber (non structural) carbohydrate peaks.

The blends of DDGS with cereal grains significantly changed ($p < 0.05$) characteristics of protein and carbohydrate structures, and protein secondary structure. FT/IR (fourier transform infra red) molecular spectroscopy in terms of identification of inherent structural changes bears a great importance. The intrinsic molecular structural changes made by blending DDGS with grains would improve the nutritional quality, energy to protein ratio, and digestive characteristics of new feed mixture. Further *in situ*, *in vitro* and on-farm studies are recommended to evaluate the effect on digestibility, availability and its structural correlation for digestive characteristics.