Association of degradation and digestion with molecular structure features of feedstocks and co-products from bio-oil processing in dairy cattle: Comparison crusher plants within Canada and within China as well as between Canada and China

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The objectives of this study were to (1) Associate the processing-induced protein molecular structure changes with protein and carbohydrate degradation and nutrient supply from feedstock (oil seeds) and co-products (canola meal) from bio-oil processing; (2) Develop a prediction models to evaluate protein and carbohydrate degradable and undegradable fractions and total nutrient supply from canola seeds and canola meal obtained from different crushing plants both in Canada and in China based on their inherent molecular structure. The Protein and carbohydrate degradation and nutrient supply to dairy cows were evaluated with Cornell Net Carbohydrate and Protein System (CNCPS 6.5). The inherent molecular structure was revealed using advanced vibrational molecular spectroscopy (Ft/IR-ATR). The molecular structure spectral analyses were carried out using uni- and multi-variate molecular spectral analyses. The model variable selection was carried out using SAS with stepwise option. The results showed that protein molecular structure spectral characteristics include α-helix height, β-sheet height, height ratio of α-helix to β-sheet, height ratio of amide I to amide II, amide I and II peak area, amide II area, and amide II height could be used to predict the degradable and undegradable protein and carbohydrate fractions as well as total nutrient supply to dairy cows. The results show that protein and carbohydrate degradation and undegradation parameters had an interactive association with the protein molecular structure in feedstocks and co-products from bio-oil processing.