Association between Carbohydrate Related Molecular Structure Spectral Profiles and Chemical Profiles, Energy Profiles, CNCPS Profiles and Rumen Degradation Parameters to Dairy Cattle Before and After Rumen Incubation of Faba Bean Partitions and Faba Bean Silage

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The primary objectives of this study were to: (1) compare chemical profiles, energy profiles, CNCPS fraction profiles and rumen degradation parameters among faba bean samples including whole crop, stem, whole pods, leaf and whole crop faba silage; (2) compare carbohydrate related spectral parameters of faba bean samples before and after rumen incubation; (3) test the relationship between carbohydrate related molecular spectral profiles before and after rumen incubation and chemical profiles, energy values, CNCPS carbohydrate fractions and NDF rumen degradation parameters. Faba bean samples were determined for chemical compositions, energy values and CNCPS carbohydrate fractions. Faba bean samples were also incubated in the rumen for estimation of NDF degradation kinetics. In addition, carbohydrate related spectral features before and after incubation were obtained using ATR-FTIR spectroscopy. The results showed that spectral features were altered during rumen incubation and a significant interaction between faba bean samples and incubation time was observed. Furthermore, spectral features of incubation residue were found to have a stronger correlation with less degradable carbohydrate fractions (NDF, ADF, ADL). Based on the results of multivariate analysis, the spectral profiles of original samples could be separated from the incubation residues, however spectral profiles of 12 and 24 h incubation residues could not be separated. In conclusion, carbohydrate related spectral features were altered during first 12 h of rumen incubation, and the change of spectral features were associated with its nutritional characteristics. Overall, carbohydrate related spectral features could be used as indicators for faba bean nutritional evaluation in dairy cattle.