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Application of two-dimensional correlation analysis to identify fishmeal and meat and bone meal by temperature-dependent near-infrared spectra

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Abstract Near infrared spectroscopy (NIRS) has been already developed for the identification of fishmeal (FM) and meat and bone meal (MBM). However, FM and MBM are complex mixtures and their NIR spectra are difficult to interpret due to weak overlapping peaks. FM has higher polyunsaturated fatty acid content than MBM. In the heating process, the fat acid oxidative rancidity degree and rate of FM and MBM differ. In addition, MBM has a higher melting point, melting from 20 to 50°C. Combining of chemical reaction and phase change in heating processing, via two-dimensional (2D) NIRS method, the feasibility of FM and MBM identification by efficient utilization weak overlapping peaks was investigated.

A total of 25 FM and 25 MBM were available, and spectra in the range of 6000–5400 cm⁻¹ were collected at 20°C and 50°C. Synchronous was calculated with wavelet transform and baseline correction spectra. Ten calibration samples have shown specific temperature sensitive peaks. There are 2 autopeaks and 2 positive cross peaks in the 5650-5400 cm⁻¹ range. FM synchronous, and a central autopeak with 4 surrounding negative cross peaks at 5760cm⁻¹ MBM synchronous. The independent validation set of 40 samples showed no false results. It was demonstrated that the above 2D-NIR method could be applied for intuitive, nondestructive and effective identification of FM and MBM.

Keywords two-dimensional correlation spectroscopy;identification;near infrared spectra;fishmeal;meat and bone meal