

Title Detection of insect-damaged wheat kernels using near-infrared hyperspectral imaging
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Abstract

Insect damage in wheat adversely affects its quality and is considered one of the most important degrading factors in Canada. The potential of near-infrared (NIR) hyperspectral imaging for the detection of insect-damaged wheat kernels was investigated. Healthy wheat kernels and wheat kernels visibly damaged by *Sitophilus oryzae*, *Rhizopertha dominica*, *Cryptolestes ferrugineus*, and *Tribolium castaneum* were scanned in the 1000–1600 nm wavelength range using an NIR hyperspectral imaging system. Dimensionality of the acquired hyperspectral data was reduced using multivariate image analysis. Six statistical image features (maximum, minimum, mean, median, standard deviation, and variance) and 10 histogram features were extracted from images at 1101.69 and 1305.05 nm and given as input to statistical discriminant classifiers (linear, quadratic, and Mahalanobis) for classification. Linear discriminant analysis and quadratic discriminant analysis classifiers correctly classified 85–100% healthy and insect-damaged wheat kernels.