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Determining Weight and Moisture Properties of Sound and Fusarium-Damaged Single Wheat Kernels by Near-Infrared Spectroscopy

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Single kernel moisture content (MC) is important in the measurement of other quality traits in single kernels because many traits are expressed on a dry weight basis. MC also affects viability, storage quality, and price. Also, if near-infrared (NIR) spectroscopy is used to measure grain traits, the influence of water must be accounted for because water is a strong absorber throughout the NIR region. The feasibility of measurement of MC, fresh weight, dry weight, and water mass of single wheat kernels with or without *Fusarium* damage was investigated using two wheat cultivars with three visually selected classes of kernels with *Fusarium* damage and a range of MC. Calibration models were developed either from all kernel classes or from only undamaged kernels of one cultivar that were then validated using all spectra of the other cultivar. A calibration model developed for MC when using all kernels from the wheat cultivar Jagalene had a coefficient of determination (R^2) of 0.77 and standard error of cross validation (SECV) of 1.03%. This model predicted the MC of the wheat cultivar 2137 with R^2 of 0.81 and a standard error of prediction (SEP) of 1.02% and RPD of 2.2. Calibration models developed using all kernels from both cultivars predicted MC, fresh weight, dry weight, or water mass in kernels better than models that used only undamaged kernels from both cultivars. Single kernel water mass was more accurately estimated using the actual fresh weight of kernels and MC predicted by calibrations that used all kernels or undamaged kernels. The necessity for evaluating and expressing constituent levels in single kernels on a mass/kernel basis rather than a percentage basis was elaborated. The need to overcome the effects of kernel size and water mass on single kernel spectra before using in calibration model development was also highlighted.

Cited by

Development and Evaluation of a Near-Infrared Instrument for Single-Seed Compositional Measurement of Wheat Kernels
Paul R. Armstrong
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