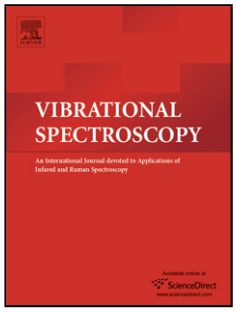

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Near-Infrared hyperspectral imaging for following imbibition of single wheat kernel sections

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Abstract

The scope of the present investigation was to evaluate the diffusion of water into single wheat kernel sections over time using Near-Infrared hyperspectral imaging. Five wheat kernels were transversely cut at about 80% slightly underneath the embryo, which was exposed to water. NIR hyperspectral images of the five surfaces were acquired at regular time intervals. The nine most representative for each kernel (reference, zero, 30 min, 1 h, 5h, 9 h, 24 h, 28 h and 33 h) were then analyzed using Principal Component Analysis (PCA) and a supervised method based on the Non-Negative Least Squares (NNLS) algorithm. The results are linked to the morphological changes and the presence of the radicle which marks the end of the germination process. Two out of five kernels had germinated at the end of the experiment. The Non-Negative Least Squares algorithm enables the changes in the different tissues of the grains (endosperm, embryo, and pericarp…) to be followed as well as the diffusion of water and the progressive appearance of the coleoptile. These preliminary results show that the kinetics of propagation of water are grain-specific: very rapid (a few minutes), slow (more than 24 h) and not observable in our study. They also demonstrate that when the seeds absorb water, this necessarily leads to germination. The aim of this study was to develop a new