



Different Ways to Assess the Vitreousness of Durum Wheat Kernels Using NIR Spectroscopy

C. Demoitié¹✉, D. Vincke¹, P.-Y. Werrie², A. Pissard¹, B. Godin²,
W. R. Meza Morales³, J. A. Fernández Pierna¹, V. Baeten¹, and P. Vermeulen¹

¹ Knowledge and Valorization of Agricultural Products Department, Quality and Authentication of Agricultural Products Unit, Walloon Agricultural Research Centre (CRA-W), Gembloux, Belgium

c.demoitie@cra.wallonie.be

² Knowledge and Valorization of Agricultural Products Department, Valorization of Agricultural Products, Biomass and Wood Unit, Walloon Agricultural Research Centre (CRA-W), Gembloux, Belgium

³ Production in Agriculture Department, Crop Production Unit, Walloon Agricultural Research Centre (CRA-W), Gembloux, Belgium

Abstract. The standard method used to grade the vitreousness of durum wheat (*Triticum turgidum* ssp. *durum*) kernels relies on a tedious visual inspection of sliced kernels. Four devices based on near-infrared (NIR) spectroscopy were tested for the assessment of kernel vitreousness: two benchtop spectrometers (XDS NIR rapid content analyzer and Infratec™ NOVA, FOSS, Denmark), a single-kernel analyzer (QSorter EXPLORER 2.0, QualySense AG, Switzerland) and a hyperspectral imaging system (FX17, Spectral Imaging Ltd., Finland). Partial least square (PLS) regression models were developed using the mean spectra of bulk samples measured on the XDS, NOVA and QSorter to predict vitreousness. Similar performances were obtained in validation with both benchtop instruments, but the best results were achieved with the single-kernel analyzer. The ratios of performance to deviation (RPD) were nevertheless >2 for all instruments. Classification models based on partial least squares discriminant analysis (PLS-DA) were developed at the kernel-level for the single-kernel analyzer and at the pixel-level with the imaging system. The implementation of the QSorter classification model on unsorted batches showed some errors but results are promising for optical sorting. The classification of non-vitreous kernels using hyperspectral imaging reached a sensitivity of 73.5% and a specificity of 92.4% in external validation. The assessment of durum wheat kernels vitreousness based on the kernels intrinsic characteristics using NIR spectroscopy showed its potential to replace the labor-intensive reference method. Despite differences in performances, each type of instrument may find its use in a different context.

Keywords: durum wheat · vitreousness · NIR spectroscopy · single-kernel analyzer · imaging