

# MRI investigation of internal defects in potato tubers with particular attention to rust spots induced by water stress

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## Abstract

Potato quality is a major concern for both producers and customers. However, potato tubers are affected by various forms of internal damage with no external symptoms, leading to substantial economic losses. MRI was used as a non-invasive and quantitative method to evaluate internal defects in potato tubers and their evolution during storage. Rust spots, induced by water stress, were considered in particular. To this end, potato plants were cultivated both in the field and in pots and their water uptake was controlled. Following harvest and throughout the storage period, 3D images of tubers were recorded on a 1.5 T MRI scanner using a fast spin echo sequence. In parallel, the multi-exponential transverse relaxation times ( $T_2$ ) of the tubers were mapped in order to provide information on changes in water status and distribution at the subcellular level in rust spots and in healthy perimedullary regions. The occurrence of rust spots correlated with water conditions in greenhouse where water intake was carefully controlled. The number and individual volume of rust spots did not change during storage period, but they significantly increased with tuber size. Bi-exponential transverse relaxation revealed differences between healthy and damaged tissue.