

Fresh-cut pear quality during storage: a NMR study of water transverse relaxation time

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Results and Discussion

Introduction

Solid-state wide-line NMR spectroscopy is a useful technique in predicting physicochemical changes and understanding structures and dynamics of complex macromolecular systems. **The purpose of this work was to use NMR methodology as a tool to evaluate fresh-cut pear quality during storage period.** Pear, as the most of biological materials, consists largely of water and macromolecules rich in protons and, since water protons are major contributors to the proton relaxation, the interactions between water and macromolecules represent the most important factors affecting the proton relaxation process. Moreover, NMR could also be used to monitoring fruit quality during storage, due to the existence of degradation water interactions, and structure and chemical compounds changes.

Material and Methods



Fresh-cut pear analysis during storage

- **Total colour difference**
 - CIE L* a* b* colour space/ with a Konica-Minolta CR-400 chromameter
 - surface colour / 5 slices from each three replicate clamshells
- **Firmness**
 - TA-XT2 Plus texture analyser
 - maximum force/ 5mm diameter probe to perforate 5mm into tissue
- **Water activity**
 - dew point hygrometer / 3 measurements for each replicate
- **Microstructure observation**
 - optical and scanning electron techniques/ photos of 3 sections from each fruit
- **NMR determination**



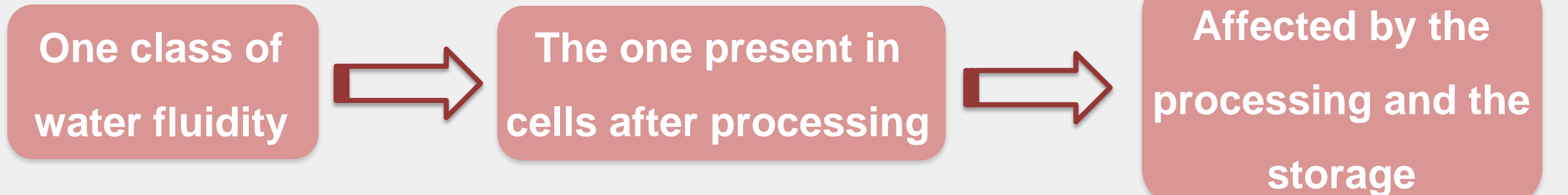
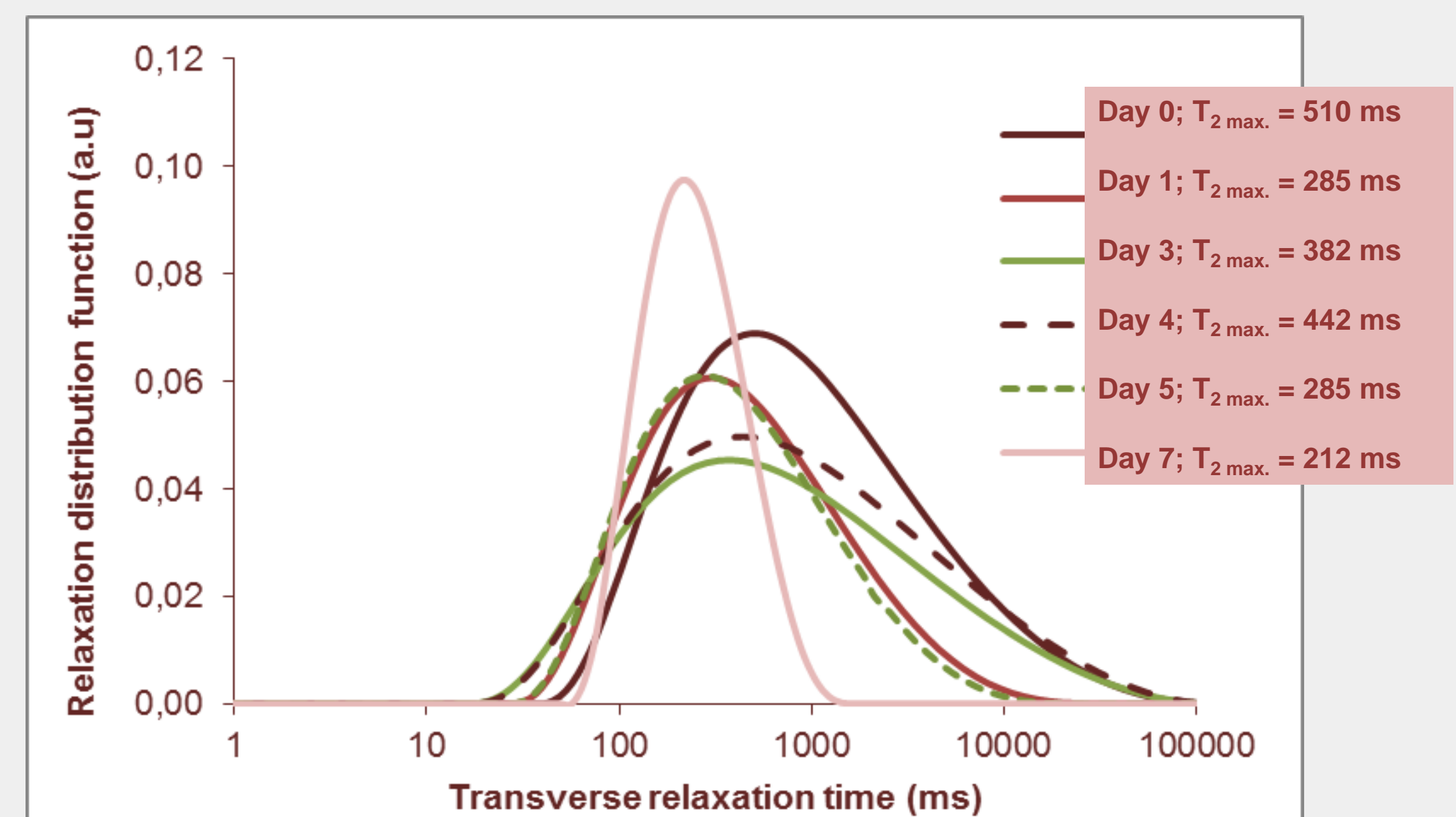
Free Induction Decay and Spin Spin Relaxation

Bruker AVANCE III 300 MHz
sample water transverse relaxation time was determined (T_2) as a continuous distribution

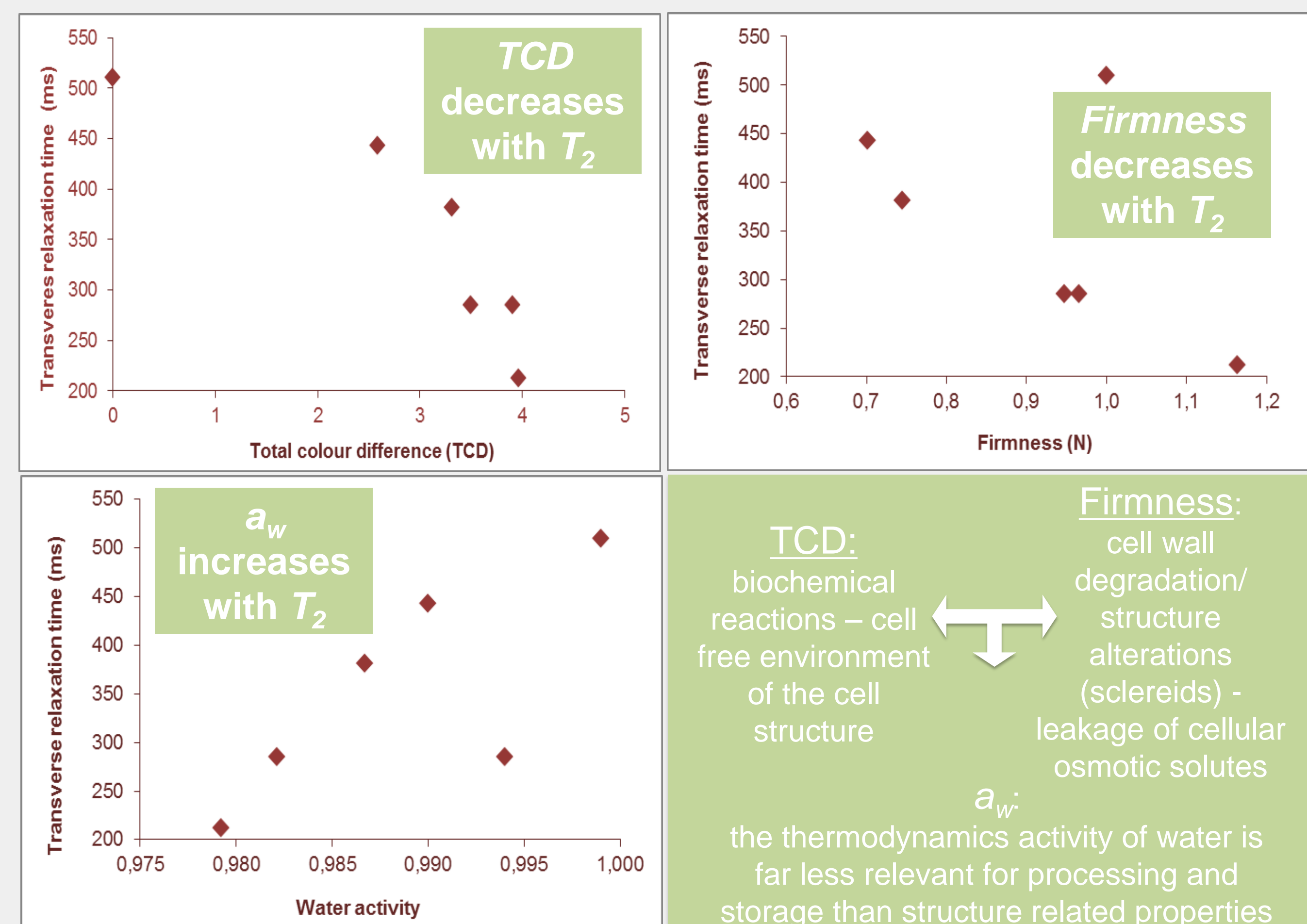
Conclusions

- ✓ T_2 distribution function presents one peak corresponding to cells total water, that modifies along storage;
- ✓ preliminary analysis fitted NMR results using a multi-exponential model, which revealed weaknesses;
- ✓ quality parameters analysed demonstrated a relationship with the value of T_2 , where the distribution function is maxima, and microscope images support results;
- ✓ results show the usefulness of NMR concept for food science, and particularly on studies on degradation reactions and stability in complex food systems.

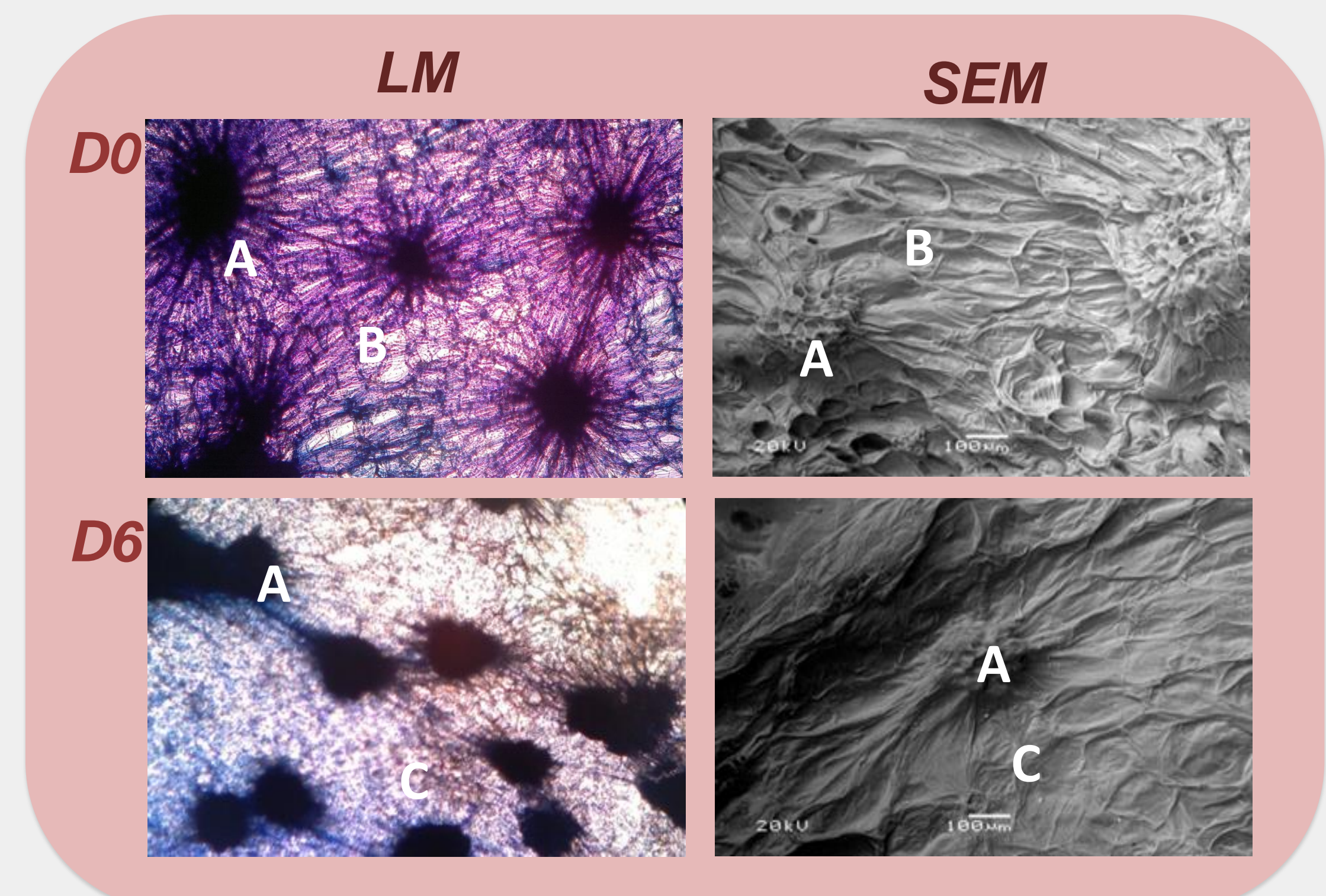
Distribution of water proton relaxation times



Transverse relaxation time as function of quality parameters



Light and scanning electron microscopic images



A – Cellular wall; B – Sclereids; C- Plasmalemma

Acknowledgements

Authors Joana F. Fundo acknowledges Fundação para a Ciência e a Tecnologia grant SFRH/BD/62176/2009. This work was supported by National Funds from FCT through project PEst-OE/EQB/LA0016/2011