# P27
# UNDERSTANDING ROASTING-INDUCED MODIFICATIONS IN COFFEE POLYSACCHARIDES USING MASS SPECTROMETRY

**Ana S. P. Moreira[1*], Fernando M. Nunes[2], M. Rosário, M. Domingues[3], Manuel A. Coimbra[4]**

[1, 3, 4] QOPNA, Department of Chemistry, University of Aveiro, Aveiro, Portugal
[2]CQ-VR, Chemistry Research Centre, Department of Chemistry, University of Trás-os-Montes e Alto Douro, Vila Real, Portugal
*Corresponding author - E-mail: ana.moreira@ua.pt, Phone: +351 234 370 360

Polysaccharides are the major components of green coffee beans. The most abundant ones are galactomannans, followed by arabinogalactans. Although it is known that galactomannans and arabinogalactans are modified during the roasting process, namely by reaction with proteins, chlorogenic acids, and sucrose, leading to the formation of melanoidins, the exact structures of the roasting-induced compounds derived from coffee polysaccharides are far to be completely elucidated. This is due to their diversity and the higher structural complexity of the new structures formed [1].
The use of simple model systems, comprising few populations of molecules able to provide information concerning the specific reactions occurring inside the coffee beans, together with mass spectrometry analysis, allow to obtain an overall view of the structural modifications in coffee polysaccharides promoted by roasting. Based on this thesis, oligosaccharides structurally related to the backbone of galactomannans, (β1→4)-D-mannotriose, and the side chains of arabinogalactans, (α1→5)-L-arabinotriose ($Ara_3$), alone or in mixtures with 5-O-caffeoylquinic acid, the most abundant chlorogenic acid in green coffee beans, and dipeptides used as models of proteins, were submitted to dry thermal treatments, mimicking the coffee roasting process [2-5]. The oxidation of $Ara_3$ induced by hydroxyl radicals was also studied, since these radicals seem to be involved in the modification of the polysaccharides during roasting [6]. New structural modifications induced by thermal and oxidative treatment of the model compounds were identified by mass spectrometry-based analytical strategies, either by direct analysis or coupling with high-performance liquid chromatography. Roasted coffee polysaccharide-rich samples were also analysed, validating the conclusions achieved with the model systems.

(1) A. S. P. Moreira, F. M. Nunes, M. R. Domingues, M. A. Coimbra, *Food Funct.* 2012, *3*, 903-915.
(2) A. S. P. Moreira, M. A. Coimbra, F. M. Nunes, J. Simo es, M. R. M. Domingues, *J. Agric. Food Chem.* 2011, *59*, 10078-10087.
(3) A. S. P. Moreira, M. A. Coimbra, F. M. Nunes, M. R. M. Domingues, *Food Chem.* 2013, *138*, 2291-2299.
(4) A. S. P. Moreira, J. Simões, A. T. Pereira, C. P. Passos, F. M. Nunes, M. R. M. Domingues, M. A. Coimbra, *Carbohydr. Polym.* 2014, *112*, 48-55.
(5) A. S. P. Moreira, M. A. Coimbra, F. M. Nunes, C. P. Passos, S. A. O. Santos, A. J. D. Silvestre, A. M. N. Silva, M. Rangel, M. R. M. Domingues, *Food Chem.* 2015, *185*, 135-144.
(6) A. S. P. Moreira, E. V. da Costa, D. V. Evtuguin, M. A. Coimbra, F. M. Nunes, M. R. M. Domingues, *J. Mass Spectrom.* 2014, *49*, 280-290.

**Keywords:** polysaccharides, roasting, structural changes, melanoidins, mass spectrometry

**Acknowledgement:** Thanks are due FCT/MEC for the financial support to QOPNA (UID/QUI/00062/2013) at University of Aveiro and CQ-VR at UTAD Vila Real (PEst-OE/QUI/UI0616/2014) through national funds, and the co-funding by the FEDER, within the PT2020 Partnership Agreement. Thanks are also due to FCT for funding the Portuguese Mass Spectrometry Network (REDE/1504/REM/2005), and the PhD grant of Ana Moreira (SFRH/BD/80553/2011).