

Arabinoxylan Gels: Impact of the Feruloylation Degree on Their Structure and Properties

Elizabeth Carvajal-Millan,[†] Virginie Landillon,[†] Marie-Hélène Morel,[†] Xavier Rouau,[†]
Jean-Louis Doublier,[‡] and Valérie Micard^{†*}

*U.M.R. Ingénierie des Agropolymères et des Technologies Emergentes, ENSAM/INRA, UMII/CIRAD,
2 Place Pierre Viala 34060, Montpellier Cedex 1, France, and UPCM, INRA, rue de la Géraudière, 44316,
Nantes Cedex 3, France*

Received June 29, 2004; Revised Manuscript Received September 27, 2004

Arabinoxylan (AX) samples of decreasing ferulic acid (FA) contents were chemically prepared from water-extractable wheat arabinoxylans without affecting their other structural properties. Gels were obtained from these partially feruloylated WEAX (PF-WEAX) by enzymatic covalent cross-linking of FA leading to the formation of diferulic (di-FA) and tri-ferulic acid (tri-FA). WEAX gelling ability was found related to the WEAX FA content whereas the gel structure and properties depended on the density of newly formed covalent cross-links. FA content of WEAX ranging from 1.4 to 2.3 $\mu\text{g}/\text{mg}$ AX gave gels with di-FA cross-links contents from 0.20 to 0.43 $\mu\text{g}/\text{mg}$ AX and G' values from 5 to 44 Pa. For WEAX gels with initial FA contents from 1.6 to 2.3 $\mu\text{g}/\text{mg}$ AX, average mesh size ranging from 331 to 263 nm were calculated from swelling experiments. Cross-linking densities of gels, determined from swelling experiments, were higher than those that could be theoretically estimated from the di-FA and tri-FA content of WEAX gels. This result suggests that, in addition to di-FA and tri-FA, higher ferulate cross-linking and physical entanglements would contribute to the final WEAX gel structure.