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P.30 Self-assembly of degalatosylated xyloglucan from tamarind seeds

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Xyloglucans are cellulose-like natural polysaccharides having a molecular structure highly branched and rich of hydroxyl groups. Xyloglucan extracted from tamarind seed has $\beta(1,4)$ -D-glucan backbone, the same as cellulose, partly substituted by $\alpha(1-6)$ -D-xylopyranosyl side chains, some of which are further substituted by $\beta(1,2)$ -D-galactopyranosyl residue.

In its native form the biopolymer is quite soluble in water and forms gel only in presence of alcohols or sucrose. When a given fraction of galactosyl residues are removed by enzymatic reaction, the polymer becomes able to form thermo-reversible hydrogels in pure water at physiological temperatures. Due to the relevance of this property for biomedical/pharmaceutical applications, a large interest is emerging about this system and the way to control or manipulate its aggregation/gelation propensity.

In this work we study the effects of the temperature on the conformation and organization of degalactosylated xyloglucan chains in aqueous solution at concentration low enough not to run in macroscopic gelation. In fact, our aim is to figure out at molecular level the mechanism by which the tuning of hydrophobic interactions leads to self-assembly and/or macroscopic gelation. The polymer solution at 0.1% w/w concentration was investigated at 15 and 37 °C by different experimental techniques (Static and Dynamic Light Scattering, Small Angle X-ray Scattering, Rheology, Circular Dichroism). The fluorescent probe 1-anilinonaphthalene-8-sulphonic acid (1,8-ANS) was used to assess the change of exposed hydrophobic surface due to the self-assembly of the polymer.

Results show that, on increasing temperature, the polymer chains and pre-existing clusters form larger structures, but the aggregation is accompanied by a density increase occurring on small length scale and similar to that observed in formation of dendrimeric structures. The relation of these results to coil-globule transition and phase separation is discussed.