**Intrinsic viscosity of exopolysaccharides: determination methods and functionality estimation**

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The intrinsic viscosity [η] is commonly used to describe the behaviour of hydrocolloids in aqueous solution and reflects interactions of single molecules with the respective solvent at infinite dilution. Therefore, [η] characterises the ability of a hydrocolloid to enhance viscosity, and, especially for microbial exopolysaccharides, it is known to serve as an estimation for their functionality in fermented food systems (e.g., contribution to stiffness in milk gels1). Intrinsic viscosity is affected by properties of the hydrocolloid (e.g., molecular mass, conformation, chemical structure, charge), the solvent (e.g., pH, ionic strength), and the environment (e.g., temperature). To determine [η] of hydrocolloids – solvent pairs, viscosities of a hydrocolloid concentration series are measured with capillary viscometers or rheometers and the reduced specific viscosity extrapolated to a concentration of zero. On the other hand, it is possible to determine relative viscosity directly from one single measurement with differential viscometers2. The aim of this study was to evaluate three different methods of [η] determination, using (I) concentration series and single point estimations from a rolling ball viscometer, (II) concentration-dependent flow curves from a rheometer and (III) size exclusion chromatography with coupled refractive index and viscosity detectors (SEC-RI/IV). Different commercial and fermentatively produced homo- and hetero-exopolysaccharides from lactic acid bacteria served as hydrocolloids for this study.

To allow correct calculations from SEC-RI/IV measurements, the purity and the refractive index increment dn/dc of all samples were determined. For commercial homo-exopolysaccharides, e.g. dextran (molecular mass approx. 105 Da), all three determination methods showed a good agreement of [η] (0.040 – 0.049 mL/mg). With increasing molecular mass (> 106 Da) and higher (intrinsic) viscosity, a broader variation occurred (dextran from *Weissella confusa* DSM20194: 0.059 – 0.156 mL/mg; hetero-exopolysaccharide from *Streptococcus thermophilus* DGCC7919: 0.294 – 0.343 mL/mg), presumably as a result of shear tinning effects in the capillary of the rolling ball viscometer.

In ongoing experiments, selected exopolysaccharides are analysed for [η] before and after enzymatic modification of the molecular structure (e.g., degree of branching, position of branching). Our findings contribute to the establishment of structure – functionality relationships for exopolysaccharides and allow a targeted synthesis of polymers with a defined functionality.

This work has been supported by Deutsche Forschungsgemeinschaft (DFG), project IDs: JA2033/3-1 | WE6416/4-1.

*References:*

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