

RHEOLOGICAL PROPERTIES OF NOVEL AUSTRALIAN ACACIA GUMS

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Polysaccharides are used in the food industry as agents to increase the viscosity of processed foodstuffs. The polysaccharides can be readily obtained from seaweeds, seeds and exudates and are classed as gums.

Australia currently imports approximately 95% of the gum used in the food industry and this represents an annual cost of twenty million dollars. One that is widely used is gum arabic, an extract from the exudate of the African species *Acacia senegal*.

Australia has over one thousand species of Acacias, some of which produce seeds and exudates in quantities large enough to warrant a comparison of the rheological properties with those of recognised food grade gums.

The viscosity of four Australian Acacia gums was measured at various concentrations in 0.2M NaCl. Two samples of gum arabic were also examined for comparison. Intrinsic viscosity ($[\eta]$), critical concentration (C^*) and coil overlap ($C^*[\eta]$) parameter were calculated and used for characterisation (see table). The intrinsic viscosity represents the fractional increase in viscosity due to solute molecules at infinite dilution and as such is independent of concentration and solvent effects. The critical concentration and the coil overlap parameter are indicators of the effect that solute concentration has on the viscosity as a consequence of polymer-polymer interaction and network entanglement. These parameters give a measure of the hydrodynamic volume of the molecule (ie the volume of solvent swept by the molecule as it tumbles through space) and coupled with molecular weight determinations can give an indication of the conformation of the molecule.

Gum	$[\eta]$ (dL-1.g)	C^* (g.dL-1)	$C^*[\eta]$
Gum arabic (Sigma)	0.17	1.58	0.33
Gum arabic (Rowntree)	0.14	1.51	0.26
<i>Acacia pycnantha</i>	0.29	1.13	0.47
<i>Acacia spectabilis</i>	0.07	1.55	0.10
<i>Acacia baileyana</i>	0.07	1.74	0.08
<i>Acacia microbotyra</i>	0.05	1.90	0.07

Gum arabic is used in confectionary where "mouthfeel" (partly determined by viscosity) is important. The gum is also used to stabilise oil/water emulsions. This is achieved by the molecules covering the oil/water interface and thus the "volume" of the molecule is important in this function. The rheological data can not be used directly to predict the functional value of polysaccharides in foodstuffs; the information can only come from empirical testing. Nevertheless, comparison of rheological data can indicate similarities between polysaccharides. The data indicate that the Australian Acacia gums differ from gum arabic and are probably not ready substitutes. *A.pycnantha* gum may be suited to some uses of gum arabic where viscosity is the most important.