

COMPOSITION AND SEQUENCE OF URONATE RESIDUES IN ALGINATES FROM BROWN SEAWEEDS USING ¹H-NMR SPECTROSCOPY

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Sodium alginate is a linear polymer of *D*-mannuronate and *L*-guluronate residues arranged in a block-wise pattern. The proportions of the two units vary widely in the alginates from different species. The physical properties of alginates depend not only upon the composition, ie the M/G ratio, but also upon the sequence of uronate distribution in the polymer. It has been shown(2) that high resolution ¹H-NMR spectroscopy may be used to determine not only the M/G ratio, but also the fractions of the four possible doublets MM, MG, GM and GG along the practically intact polymer chain.

Alginates were isolated from the sodium carbonate extract(1) of four species of brown seaweeds: *Cystoseira trinoids*, *Turbinaria conoides* and two unidentified species of *Sargassum*. Partial depolymerisation (to reduce the viscosity of the solution) was carried out with dilute acid (30 min., 100°C, pH 3.0). The hydrolysed samples (10 mg) were dissolved in D₂O (0.5 ml) and EDTA (3 mg) was added to each sample to prevent the interaction of traces of divalent cation with glycourans. ¹H-NMR spectra were run at 99.6 MHz on a JOEL-FX100 NMR spectrometer operating in the Fourier-transform mode. The spectra were recorded at 90°C.

Results (see Table) show that all four alginate samples analysed contain more guluronate than mannuronate residues. The doublet frequencies indicate that the polymer is composed of fairly long G blocks and shorter M blocks, and that the alternate MG and GM character is very small.

SECTION E

TABLE

			F_G	F_M	F_{GG}	F_{GM}	F_{MG}	F_{MM}	M/G
<i>Cystoseira trinodis</i>	...	...	0.81	0.19	0.67	0.14	0.14	0.05	0.23
<i>Turbinaria conoides</i>	...	...	0.65	0.35	0.58	0.07	0.07	0.28	0.54
<i>Sargassum</i> sp. (linear)	...	...	0.65	0.35	0.59	0.06	0.06	0.29	0.54
<i>Sargassum</i> sp. (oval)	...	...	0.74	0.26	0.68	0.06	0.06	0.20	0.35

F_G and F_M — mole fractions of guluronate and mannuronate residues.

F_{GG} , F_{GM} , F_{MG} , F_{MM} — frequency of these doublets along polymer chain.

We are grateful to Prof. S. Balasubramaniam (University of Peradeniya) for the collection and identification of plant material; Dr. Hans Grasdalen for helpful suggestions and the University of Uppsala for facilities and assistance provided. We thank the International Foundation for Science for financial assistance and the National Science Council of Sri Lanka for a research grant.

References

1. De Silva, S., Kumar, S., Sultanbawa, M. U. S. and Balasubramaniam, S., *Proc. Inst. Chem. Ceylon*, 5 (1980).
2. Grasdalen, H., Larsen, B. and Smidsrod, O., *Carbohydrate Res.*, 68, 23 (1979).