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Physicochemical Characterization of Polysaccharides Extracted from Sesame Leaves: A Potential Matrix for Sustained Release Tablets

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Purpose
In the developing world the pharmaceutical sector depends heavily on imported raw materials which elevate the cost of medicines beyond the reach of the majority of the local population; despite often being rich in renewable sources which could be used as excipients. In this study we have extracted and characterised a largely undeveloped polysaccharide, sesamum gum, with a view to application as an alternative pharmaceutical excipient.
Methods
Polysaccharide from the leaves of Sesamum indicum was extracted by maceration in distilled water followed by precipitation in absolute ethanol. The material was oven dried and milled to a particle size of 250 m. The resulting material was characterized using X-ray diffractometry (XRD), Fourier transform infra-red spectroscopy, differential scanning calorimetry and thermogravimetric analysis. The total carbohydrate content, protein content and intrinsic viscosity of the extracted gum were determined according to standard protocols. Constituent sugar analysis of the material was determined by high performance anion exchange chromatography after hydrolysis of the samples using 2M trifluoroacetic acid for 3 hours. Compaction studies were carried out using a Testometric materials testing machine and data analysed by Heckel analysis.
Results
The polysaccharide gum had a total carbohydrate content of 98.1% and protein content of 1.7%. XRD spectra were typical of an amorphous material with a maximum decomposition temperature of 266.7 °C. Intrinsic viscosity was determined to be approximately 3.31 and 4.40 dl/g in 0.1 M NaCl and deionized water respectively. Dispersions of the polysaccharide are viscoelastic and exhibit shear-thinning behaviour. The polysaccharide contains fucose (0.1%), rhamnose (1.1%), arabinose (2.8%), galactose (48.9%), glucose (2.7%), mannose (6.8%) and xylose (33.6%) as neutral sugars, and glucuronic acid (3.0%) and galacturonic acid (1.1%) as acid sugars. Heckel analysis indicates that sesamum consolidates plastically having mean yield pressure of 131.45 MPa.
Conclusion
Sesamum polysaccharide is typically amorphous with a low content of uronic acids. Results suggest it is a thermally stable, high molecular weight polymer which exhibits shear-thinning behaviour in the hydrated form. The polymer in the dry state is a highly compactable material which has the potential to be exploited as a matrix former in sustained release tablets.