

previously described starting from a semi-defined lactose-rich medium via fermentation by *Rhanelia aquatilis*. Since lactose is the major solid component of whey, production of that high-added value exopolysaccharide may help alleviate the environmental problems raised by whey as the major by-product of the cheesemaking industry

The polysaccharide was produced using five different fermentation media: a synthetic medium, plain whey under aerobic conditions, whey permeate, whey with 2% NaCl, and plain whey under anaerobic conditions. Lactan was recovered, from each medium, by precipitation with 50% ethanol and then lyophilized. Each aliquot of polysaccharide was solubilized in deionized water and solutions with different polysaccharide concentrations, different pH values, and different ionic strengths were analyzed under steady shear flow using a controlled stress rheometer (Carri-Med 50) with cone-and-plate geometry.

All lactan solutions showed a shear-thinning behaviour, and increases in viscosity were observed for increasing concentrations of polysaccharide as expected. The polysaccharide produced from whey with 2% salt and plain whey fermented under anaerobic conditions showed lower viscosity than that obtained from the remaining media. Addition of salts (e.g. KCl and CaCl<sub>2</sub>) led to decreases of viscosity, which was virtually the same irrespective of salt concentration. Changes of pH (3–11) affected slightly the viscosity of the polysaccharide solutions, although higher viscosities were obtained at pH 7. The slight effect of pH and ionic strength can be somewhat implicated with the galacturonic acid residues present in the polymer chain. The polysaccharide samples possessed different protein contents, which may have influenced to some extent the rheological behaviour of the gel. The shear-thinning properties of the gum lead to potential applications in several food and non-food products.

### Regio- and Stereoselectivity Issues in Allylic Reactivity of Vinylogous Esters/Carbonates Bearing the 2,3,4,6-tetra-*O*-acetyl- $\beta$ -D-glucopyranosyl Auxiliary

A.P. Esteves<sup>a</sup>, A.M. Freitas<sup>a\*</sup> and R.J. Stoodley<sup>b</sup>

<sup>a</sup>Departamento de Química, Universidade do Minho, Campus de Gualtar, 4710 Braga, Portugal and <sup>b</sup>Department of Chemistry, UMIST, PO Box 88, Manchester M60 1QD, England

Carbohydrate-based dienes have been shown to exhibit good-to-excellent diastereofacial selectivity in their reactions with cyclic dienophiles and aza-dienophiles. Glucose-bound vinylogous systems have previously been synthesized and shown to undergo diastereoselective addition reactions. In the present study new cyclic and acrylic vinylogous esters/carbonates were synthesized and their diastereofacial reactivity studied. With bromoallylic derivatives the nucleophilic displacement of the bromine atom was performed with oxygen, nitrogen and sulphur nucleophiles affording, in some cases, allylic rearrangement products where a new stereogenic centre was developed with medium-to-good diastereoselectivity. A model of reactivity is advanced on the basis of the absolute stereochemistry established by X-ray analysis.

### Quantification of Mercury in Sugar by Cold Vapour Atomic Absorption Spectrometry

M.E. Soares, M.L. Bastos<sup>\*</sup> and M.A. Ferreira

CEQUP-Faculdade de Farmácia, Universidade do Porto, R. Anibal Cunha, 164, 4050 Porto, Portugal

Mercury is a heavy metal which levels in environment are of growing concern due to its biomagnification in certain live systems and consequent human dietary intake. Several studies have been performed to accomplish for the Hg contamination extent, almost all of them being performed in sediments, soils, water and fish. Nevertheless, some studies have also included the monitorization of mercury in agricultural and horticultural crops, namely crowns and leaves of sugar beet, and in the corresponding soils where they were cultivated, to correlate the element contents. Posterior determinations of mercury in crops were performed, which included sugar cane. Recently, additional studies have highlighted the correlation between mercury soil contamination and respective plant contents as is reported for rosemary and mushrooms. As a consequence, some countries have already proposed maximum acceptable levels for mercury in crops and the Joint FAO/WHO Experts Committee on Food Additives established a provisional tolerable weekly intake for total mercury of 0.3 mg of Hg/person.

As saccharose is a purified product from vegetal origin, it is important to control its mercury contamination and this communication presents a method for its quantification. The sample preparation consists of a wet digestion of the matrix with H<sub>2</sub>SO<sub>4</sub> and NHO<sub>3</sub> (1:2, v/v) in a closed PTFE container at controlled temperature (80°C) for 2 h; afterwards, saturated KMNO<sub>4</sub> solution is gradually added into the sample solution to complete the mineralization. The measurement of the element is achieved by cold vapour atomic absorption spectrometry after reduction of the oxidized mercury compounds with sodium borohydride solution.

The detection limit is 0.28  $\mu$ g/L and the linearity range in the optimized conditions is 0.28–20  $\mu$ g/L. The precision is 9.0% and 11.0% for the analytical and over-all procedure, respectively. The validation of the procedure was performed by using a reference material and by the standard additions method (2.5, 5.0 and 10.0  $\mu$ g/L), being the recoveries higher than 90%.

### Quality Evaluation of Portuguese Honeys

E. Mendex, E. Brojo Proença, I.M.P.L.V.O. Ferreira<sup>\*</sup> and M.A. Ferreira

CEQUP/Laboratório de Bromatologia da Faculdade de Farmácia da UP Rua Anibal Cunha 164, 4050 Porto, Portugal

Honey is the sweet viscous substance elaborated by the honey bee from the nectar of floral plants. It is produced in almost every country of the world and is a very important energy food, used as an ingredient in hundreds of manufactured foods, mainly in cereal based products, for sweetness, colour, flavour, caramelization and viscosity. Several types of honey are produced in Portugal. Sugars represent the largest portion of honey composition (95–99% of the honey solids). Fructose and glucose are the most abundant sugars in it, but others are usually mentioned, namely, saccharose, maltose, melibiose and trealose. Its composition depends highly on the types of flowers used by the bees as well as regional and climatic conditions.

Adulteration of honey is possible, so its quality must be controlled analytically with the aim of guaranteeing the genuinity and preserve consumer from commercial speculations. The present work was conducted to investigate the quality of 25 brands of Portuguese honeys commercially available on the market, in a total of 50 samples. Carbohydrate composition was determined by HPLC-RI to evaluate the monosaccharides, fructose and glucose, the disaccharides, sucrose, maltose, trehalose and melibiose and the trisaccharide melizitose. Sucrose content is important to determine heavy