THE PHYSICOCHEMICAL PROPERTIES OF DIETARY FIBRE ARE DEPENDENT ON THE CHEMICAL COMPOSITION OF GLYCOPOLYMERS

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Abstract

Relationships were found between the water retention capacity and the concentration of alcohol insoluble pectins, particle size of dietary fibres. Parameters of π-electron cloud would have a significant role in the water adsorption capacity of fibres. Relationships were found between mixed biopolymer compositions and viscosity characteristics. These results show that the viscosity of 5% water suspension increased through the increase of the grade esterification of water soluble pectins and the galacturonic acid content of alcohol insoluble pectins in dietary fibres. The viscosity of 1% water dispersions of these fibres increased during increasing the molecular weight of water soluble pectin. The obtained fibres can serve to enhance water and oil retention, improve emulsion stability, production of the gel delivery system and foamed cream delivery system based on dietary fibres and bioactive components for use in the treatment, prevention, and diagnosis. The dietary fibres have shown the inhibition of cell proliferation (HT29).

Key words: *mixed biopolymers, dietary fibres, physicochemical properties, viscosity, gelling strength*

1. INTRODUCTION

The type of natural macromolecular compounds containing covalent bound fragments of polymers more than one class, called the mixed biopolymer, and more recently – glycoconjugate. Structures of mixed biopolymers are highly complex. Although this definition is applicable to different polymeric systems, we focus on fibre systems. The first, the plant cell wall is a complex macromolecular structure. The structure is formed by the glycopolymers, proteins, aromatic and aliphatic compounds of the cell wall of plants. The second, the ultra-structural model of wall structure, presented in recent reviews [Kerry Hosmer et al., 2009], argues for two independent networks within the primary cell wall; the pectin–pectin and xyloglucan–cellulose network. In that model, the glycopolymers of the pectin–network, proteins, and phenolic compounds are organized independently around the framework of the cellulose–xyloglucan network. Such a model utilizes the well-established model of the pectin–pectin network and the xyloglucan (XG)–cellulose network. Furthermore, there is increasing evidence that the pectin interacts, perhaps covalently with hemicelluloses. Hemicelluloses [Christina Schädel et al., 2010] are grouped into four classes according to their main types of sugar residues: xyloglucans, xylans, mannans and mixed-linkage β–glucans. Therefore, the realistic wall model should be integrated as the pectin network, the cellulose xyloglucan network and other wall structural components that were characterized. Pectin molecules are cross linked by phenolic compounds [Kerry Hosmer et al., 2009] that make up >2% of the wall [O´Neill M. A. et al., 2003]. The revised wall model would demonstrate the highly cross linked wall wherein pectin–pectin, pectin–xyloglucan, pectin–phenolic, pectin–protein, and xyloglucan–cellulose networks provide a cohesive wall network [Keegstra K. et al., 1973]. From these data it is clear that the chemical nature of fibres is the complex i.e. the mixed biopolymer. The fibre as a class of compounds includes a mixture of plant glycopolymers, both oligosaccharides and polysaccharides, e.g., cellulose, hemicellulose, pectin substances, gums, resistant starch, inulin, that may be associated with lignin, and other non-carbohydrate components (e.g., polyphenols, waxes, saponins, cutin, resistant proteins) [Mohamed Elleuch et al., 2011]. The first definition of dietary fibres (DF) [Mongeau R., 2003] was in 1972.