PHYSICAL AND CHEMICAL PROPERTIES AND BETA CAROTENE ENCAPSULATION OF WATER SOLUBLE MOLECULAR REARRANGEMENT GLUCANS SYNTHESIZED BY AMYLOSUCRASE

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Amylosucrase (ASase, EC 2.4.1.4) is an enzyme that catalyzes the biosynthesis of molecular rearrangement glucans (MRGs) formed α-1→4 glycosidic linkages, using sucrose as the solo substrate through a non-processive mechanism. The long-chain MRGs produced by ASase tend to aggregate during enzyme reaction while the short-chain MRGs in the enzyme reaction product remain water-soluble MRGs to produce various chain lengths and crystalline structures. In this study, we investigated the physical-chemical properties of water soluble MRGs synthesized by various sucrose concentrations (100~900mM) and encapsulated the beta-carotene with soluble MRGs synthesized by 100mM sucrose. Firstly, we determined the number-average degree of polymerization (DPn), with the highest observed value being 25.6 for MRGs synthesized with 100 mM sucrose (referred to as 100 MRGs) and the lowest value being 18.7 for MRGs synthesized with 900 mM sucrose (referred to as 900 MRGs). Similarly, both the number-average and weight-average molecular weights (Mw and Mn) were evaluated with similar results. For field-emission scanning electron microscopy (FE-SEM), we observed that 100 MRGs appeared as small spherical microparticles, with the size of these spheres increasing as the sucrose concentration increased. X-ray diffraction (XRD) analysis indicated that 100 and 300 MRGs observed A-type crystal patterns, while 500, 700, and 900 MRGs observed amorphous patterns. Furthermore, MRGs of amorphous patterns were greater solubility when compared to 100 and 300 MRGs. Finally, we confirmed the self-assembly of soluble MRGs with beta-carotene at low temperatures through raman spectra analysis.

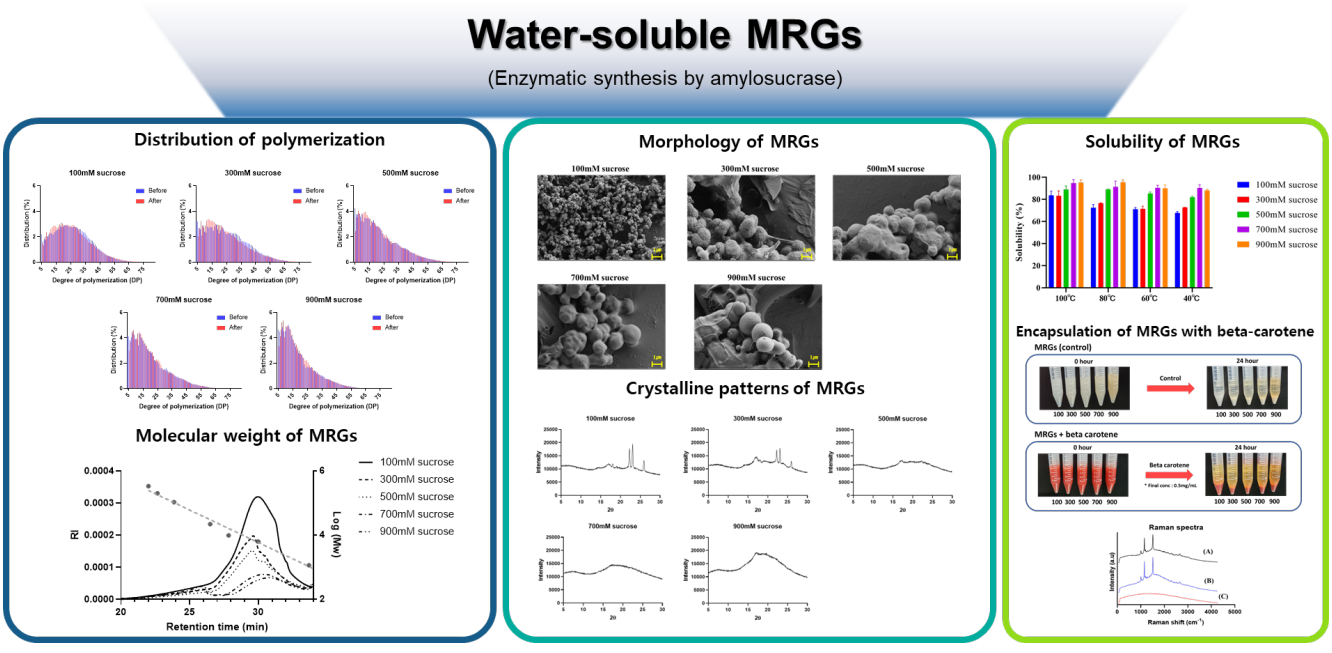

Figure 1. Graphical abstract of water-soluble MRGs