Synopsis of Original Research Paper

Synthesis, structure and property analysis of hyperbranched glucan as a high moisturizing agent by a novel branching enzyme

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In recent years, the development of environmentally friendly materials with reduced environmental impact has been promoted in various fields in order to realize a sustainable society. Among them, materials synthesized by microbial enzymes are attracting attention as environmentally friendly materials because they do not require organic solvents during synthesis and are decomposed by microorganisms without causing environmental pollution.

Haloarcula japonica, a halophilic archaeon that requires high concentrations of salt, harbors the malA gene encoding an enzyme of the α-amylase family in its genome, and recombinant MalA expressed in *H. japonica* efficiently catalyzes the transfer of short glucose chains and produces highly water-soluble hyperbranched glucan This property has been shown to produce a highly water-soluble hyperbranched glucan. This property makes the synthesized glucan potentially applicable as a high-performance moisturizer.

In this study, recombinant MalA was prepared to gain insight into the substrate specificity of MalA, and high molecular weight glucans were synthesized utilizing various maltodextrins and polysaccharides to analyze their chain length distribution. Furthermore, the solubility of glucans synthesized with MalA was evaluated under different NaCl concentrations. The results revealed that MalA mainly synthesizes highly branched glucans from maltodextrins of degree of polymerization (DP) 3 or higher and shows a unique ability to produce branched glucans from very short oligosaccharides such as G3. Furthermore, the glucan synthesized with MalA showed higher solubility than those synthesized without enzymatic treatment, suggesting its potential as a high-performance moisturizer.

The synthesized glucans have potential applications in the cosmetics industry as an environmentally friendly alternative to palm oil and squalene, addressing concerns regarding deforestation, human rights issues, and species extinction. Further studies on the structure and properties of the synthesized branched glucan will facilitate its use as a high-performance moisturizer in cosmetic formulations.