THE BIOLOGICAL FUNCTION AND THE ENZYMATIC MODIFICATION OF XYLOGLUCAN

Kazuhiko Yamatoya*, Mayumi Shirakawa and Hiroyuki Yamada

Food Science Division, Dainippon Pharmaceutical Co., Ltd., Osaka, Japan
kazuhiko-yamatoya@dainippon-pharm.co.jp

Xyloglucan is a component of the cell walls of higher plants[1]. Xyloglucan cross-links plant cellulose microfibrils and provides flexibility. Various biological activities of xyloglucan in plants have been reported, e.g., its metabolism controls the elongation of plant cell. Xyloglucan has a β-1,4- glucan backbone with 1,6-α-xylose side chains and some of the xylose residues are β-D-galactosylated at O-2. The enzymatic modification of xyloglucan to elicit new biological functions or unique properties is highlighted.

IL 18

In solution, xyloglucan exhibits typical Newtonian flow. It has been used as a thickener and starch modifier in food processing in Japan and some Asian countries [2]. It is often called "aging-free starch", since it has properties similar to those of starch but is more stable. Of greater interest is the fact that xyloglucan can confer novel rheological properties to the aqueous phase. Xyloglucan from which galactose has been partially removed by β-galactosidase showed a unique property of heat-induced reversible gelation, and reverted to sol upon cooling [3]. It had two sol-gel transition points. This gelation has caused by the formation of a cross-linked domain by a flat structure with rod-like chains. The architecture of this xyloglucan has been investigated by small-angle X-ray scattering combined with Monte Carlo simulation based on molecular mechanics [4].
Various physiological effects of dietary fiber, such as its ability to control blood glucose and reduce lipids, have received considerable attention. Xyloglucan is an indigestible polysaccharide that acts as dietary fiber. Xyloglucan and partially hydrolyzed xyloglucan by β-glucanase have been shown to improve lipid metabolism and reduce the weight of adipose tissue in rats fed a high-cholesterol diet [5]. Acceleration of the metabolism and excretion of endocrine disrupting chemicals by xyloglucan has been reported [6].

Our final target is tailor the xyloglucan molecule to achieve the optimum or unprecedented function. Further studies are needed to understand the structure and the function relationship.

References :

[1] Hayashi, T. *Annu. Rev. Plant Physiol. Plant Mol. Biol.***1989**, 40,139.
[2] Yamatoya, K. and Shirakawa, M. *Current Trends in Polymer Science* **2003**, 8,27.
[3] Shirakawa, M.; Yamatoya, K. and Nishinari, K. *Food Hydrocolloids* **1998**, 12,25.
[4] Yamanaka, S. ; Yuguchi, Y. ; Urakawa, H. ; Kajiwara, K. ; Shirakawa, M. and Yamatoya,K.*Journal of The Society of Fiber Science and Technology*,**1999**, 55,11,57.
[5] Yamatoya, K. ; Shirakawa, M. and Baba, O. *Hydrocolloids Part 2*, Nishinari, K., ed.,Elsevier, Amsterdam **2000**, p.405.
[6] Saito, Y. ; Ogawa, A. ; Sumii, K. ; Umeki, M. ; Yamamoto, K. and Ikegami, S. *Abstract of the 57th Annual Meeting of the Society of Jpn. Soc. Nutr. Food Sci.,* **2003**, p.292.