（学位第３号様式）

学 位 論 文 要 旨

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題　目	Structural and functional analysis of cell wall polysaccharides from macroalgae (大型藻類の細胞壁多糖の構造および機能解析)

Macroalgae are well-known producers of bioactive polysaccharides which are abundant in algal cell wall, so that they play key roles in the different fields of industries. However, function of polysaccharides is highly affected by their structure which can vary due to the species, age, and growth place. Structural variation will be challenging to produce uniform bioactive compounds. Therefore, I mainly focused on structural and functional analysis of macroalgal polysaccharides from *Caulerpa lentillifera* and *Cladosiphon okamuranus* which are extensively utilized and abundantly cultivated in Okinawa.

In the first experiment, I extracted sulfated polysaccharide (SP) from *C. lentillifera* and examined its hyaluronidase (HAase) inhibitory activity. Results showed that SP was a promising inhibitor of HAase with IC_{50} of 163 μg/mL. Then we analyzed, the relationship between the structural properties of SP and HAase inhibitory activity. Having significantly higher activity in native SP than desulfated and partially acid hydrolyzed SP suggested that HAase inhibitory activity extremely depends on its structural properties: sulfate content and molecular weight (MW).

Since I found structural properties are important for activities, my second study analyzed the structure of polysaccharide from *C. okamuranus* which is an excellent source of fucoidan with numerous activities and contains the highest fucoidan among any brown algae spp. Many previous studies described the individual structure and activity of soluble fucoidan from *C. okamuranus,* but it was poorly understood whether insoluble residue of cell wall contains fucoidan and how different its structure is. Thus, aside from soluble fucoidan, I analyzed polysaccharide in the residues after extraction of soluble fucoidan. Hence, cell wall was sequentially treated with hot water (HW), ammonium oxalate, KOH and fractionated into five fractions. I found that cell wall from *C. okamuranus* was mainly consisted of HW and hemicellulose (HC)-I fractions which occupied 80% in cell wall. Furthermore, it was found that both of them contained fucoidan. Particularly, fucoidan in HC-I was structurally different from fucoidan in HW in terms of sulfate content, MW, and sugar residue which was 1,4-linked xylose and 1,4-linked fucose. I also showed for the first time that fucoidan in HC-I may be involved in reinforcing cell wall structure.

In third experiment, I analyzed the structural variation of polysaccharide of *C. okamuranus* from 8 different habitats in Okinawa prefecture. Although yield, chemical composition and MW of fucoidan in HW differ slightly at different habitats, the results showed relatively uniform structural cell wall in *C. okamuranus* from any geographical location in Okinawa prefecture at peak harvesting period.

In conclusion, structure of macroalgal polysaccharide is very important on their activities and knowledge on variation of structural properties will help to improve the quality of polysaccharides for industrial application in the future.