（学位第３号様式）

学　位　論　文　要　旨

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題　目	Screening of microorganisms that produce polysaccharides from D-xylose and applications of the microbial polysaccharides

To combat global warming and to break away from a society dependent on fossil fuels, there is a growing demand for the use of biomass resources. The most abundant biomass resource on Earth is plant cell walls, the main components of which are cellulose, hemicellulose, and lignin. Cellulose was mainly used for bioethanol production, but recently it is expected to be utilized as cellulose nanofiber. Lignin is used as fuel for thermal power generation, and attempts are being made to use it in bioplastics. In contrast, hemicellulose has been utilized only a little compared to its abundance. The are several reasons for the lag behind cellulose and lignin in the research and utilization of hemicellulose. Hemicellulose is a heteropolysaccharide with a complex branched structure consisting of several types of sugars, and its main component is pentose, which is not suitable for fermentation. Therefore, biomass utilization research has been aimed at the utilization of cellulose. However, research has been conducted to utilize hemicellulose generated as a byproduct in the process of cellulose preparation. In this thesis, research was conducted to fractionate xylan, the most abundant hemicellulose, from biomass and to develop new methods of utilization after fractionation, to create new uses for hemicellulose. First, sugarcane bagasse, a byproduct of sugar manufacturing, which is a key industry in Okinawa Prefecture, was used as the research material, and the effectiveness of ammonia pretreatment was examined to selectively release xylan from the bagasse using enzymes. When bagasse was pretreated with ammonia solution, xylan was significantly reduced. However, when bagasse was pretreated with anhydrous ammonia, little xylan loss was observed. When xylanase was applied to the ammonia-pretreated bagasse, the hydrolysis rate of xylan was about 50% for the bagasse pretreated with ammonia water but more than 80% for the anhydrous ammonia-pretreated bagasse. These results suggest that pretreatment with anhydrous ammonia is an effective method for enzymatic recovery of xylooligosaccharides.

Next, to promote the utilization of hemicellulose, we screened microorganisms that produce polysaccharides from D-xylose. Four strains, *Kosakonia* sp. (SO_001), *Papiliotrema terrestris* (SO_005), *Pseudarthrobacter* sp. (SO_006), and *Williamsia* sp. (SO_009) were selected from samples collected from various locations in Okinawa Prefecture. The molecular weight and sugar composition of the polysaccharides produced by these four strains were different. The polysaccharides produced by SO_005 and SO_009 formed films. When alum was added to each polysaccharide and a gel formation test was conducted, aggregation or gelation was observed for the polysaccharides produced by SO_001 and SO_009, indicating the possibility of using these polysaccharides as a new polymeric material.

This thesis shows a new method for selectively extracting hemicellulose from biomass and converting it into thickened polysaccharides for utilization. This method is expected to greatly expand the applications of hemicellulose and to be a breakthrough in biomass utilization.