Saccharification of marine microalgal biomass for bioethanol production using marine bacteria

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Bioethanol production have been an increasing worldwide interest in alternative non-petroleum-based sources of energy. Nearly, all fuel ethanol is produced by fermentation of corn sugar and sugarcane wastes as agronomic wastes. In the marine environment, marine algae are primary producers and are also huge biomass producers. Some algae were reported to have high contents of carbohydrate that can be used as a substrate for bioethanol production. In addition to agronimic wastes, we focus on development of bioethanol production process from marine algae.

Bioethanol production from marine algae will be divided into two major processes. One is a saccharification of starch to sugar and other is the fermentation process by yeast. In the saccharification of starch, enzymatic processes using amylase have been applied. *Aspergillus sp.* and *Bacillus sp.* produce large amounts of extracellular amylase, and are commonly used. However, desalinination process might be required to develop a direct bioethanol production from marine algal biomass. Therefore, marine amylase may be more suitable for saccharification of marine algal biomass.

The first step involves screening of amylase producing marine bacteria from marine environments. Marine bacteria, isolated from the Japanese coastline and grown on basal medium, were tested for saccharification of starch. The strain NKMB 0074 was identified as having the highest glucose accumilation in the medium out of a hundred ninety-one isolates. Next, we investigated amylase production by marine NKMB 0074 and saccharification of microalgal biomass with high starch contents.

Bioethanol in Brazil and USA are traditionally produced from sugarcane and corn. The sugar, starch and agriculture wastes are the primary substrates for bioethanol production. In the marine environment, micro and macro algae are primary producers growing autotrophically through photosynthesis and are also large-scale biomass producers. High intracellular starch contents in some organisms have been found. Therefore, marine micro and macro algae used as biomass could be utilized as a substrate for bioethanol production.