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Methane Production Using Cattle Rumen Fluids and Its Application to Reduce Volume of Radiation-polluted Biomass

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Introduction

The solubilization of lignocellulose components (cellulose, hemicellulose, and lignin) is a rate-limiting step in methane production from plant biomass. On the other hand, rumen fluid (the contents of the first stomach of cattle; slaughterhouse waste) contains lignocellulose-degrading microbes and enzymes. In the present study, rapeseed stem was used as a model of plant biomass, and was pretreated by rumen fluid for methane production. In addition, solubilizing the radiation-polluted biomass by using this treatment for removing cesium was also attempted.

Results and Discussion

Rapeseed was solubilized by pretreatment, and volatile fatty acids were produced. Methane fermentation of pretreated rapeseed was performed, and the methane production of pretreated rapeseed was increased 1.6 times compared with untreated rapeseed. The plant cell wall-degrading enzyme activities (cellulase and xylanase) were determined, and those activities of pretreatment were 10-100 times higher than those of methane fermentation. These results suggest that the plant cell wall was well hydrolyzed during the pretreatment, allowing greater methane production. Additionally, as a result of treating the radiation-polluted biomass by rumen fluid, radioactive cesium was found in liquid fraction. Thus, a possibility that cesium would be removable from the polluted biomass by using this method was also suggested.