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著者	Baba Yasunori, Lee Chol Gyu, Tada Chika, Fukuda Yasuhiro, Nakai Yutaka
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Pretreatment of Lignocellulosic Rapeseed Waste by Rumen Fluid for Methane Production

**Yasunori Baba^{1,2}, Chol Gyu Lee¹, Chika Tada¹,
Yasuhiro Fukuda¹ and Yutaka Nakai¹**

¹Tohoku University, Japan

²Research Fellow of the Japanese Society for the Promotion of Science (JSPS), Japan

Introduction and Objectives

Rapeseed is an oilseed crop that is cultivated around the world. Because rapeseed has a high tolerance to salinity, it is now being cultivated in Japan on agricultural lands affected by the tsunami disaster following the Great East Japan Earthquake of 2011. Byproducts of rapeseed oil production include thinned green growth, threshed stems, and pressed oilseed cakes. Typically, these byproducts are incinerated, but in this study they were used as substrates for methane production. The hydrolysis of lignocellulosic biomass such as plant stems is a rate-limiting step in methane production. We examined whether the efficiency of methane production from rapeseed waste could be improved by pretreatment with rumen fluid (from the first stomach compartment of a ruminant), slaughterhouse wastes.

Methods and Results

Rapeseed (*Brassica napus*) stems were dried and milled, and then used for methane production after pretreatment with rumen fluid. Rumen contents were collected from grass-fed cattle. The rapeseed stems were pretreated with rumen fluid at 37°C for 24 h. The main metabolic products were acetate and propionate. In the following treatment, 200 ml of the rumen-treated rapeseed stems was added to 400 ml of seed sludge, and batch-type methane production was performed at 35°C for 36 days. Methane production from untreated rapeseed stems was also performed for comparison. More methane was produced from pretreated stems than the untreated stems. These results suggest that the lignocellulosic biomass was well hydrolyzed during the rumen fluid pretreatment, allowing greater methane production. We are now analyzing the degradation rate of the lignocellulosic components (cellulose, hemicellulose, and lignin).