

Effect of Rice Cultivars on CH₄ Emission related Microbial Activity in Paddy Soil (벼 품종이 메탄 생성균과 산화균 활성에 미치는 영향)

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Rice cultivar is one of the important factors to control methane (CH₄) emission from the flooded paddy soil during rice cultivation. But the relationships between rice cultivars and activities of microorganisms related to CH₄ production and oxidation were not studied well. In this study, CH₄ emission was investigated using different rice cultivars by closed-chamber methodology during rice cultivation. Rice cultivars included two early-maturing varieties (Odae and Woonkwang) and six medium-late maturing varieties (Nampyeong, Dongjin, Samkwang, Ilmi, Junam, Chuchung) cultivated under standard cultivation condition in a typical paddy soil (Yuga series). To quantify the related microorganisms affecting CH₄ emission, methanogenic and methanotrophic activities were compared by quantitative PCR analysis during CH₄ emission peak season. Specifically, low and high affinities methane oxidation potential were also evaluated by an incubation test at 37°C for 23 days. Total CH₄ flux was lowest in Dongjin (late maturing), and increased in the order of Chuchung ≤ Ilmi ≅ Woonkwang ≅ Junam ≅ Samkwang < Odae ≅ Nampyeong. Despite shorter cultivation period with early-maturing varieties, no significant decreasing effect on CH₄ emission was observed. Higher *mcrA* gene copies which is responsible for increasing CH₄ emission were quantified in Odae and Nampyeong varieties, while Dongjin and Odae showed higher *pMMO* gene copies involved in methanotrophy. Even though rice biomass productivity is known to have strong positive correlation with CH₄ emission having similar rice cultivar condition, we could not find any statistical correlation with plant growth and yield characteristics to seasonal CH₄ flux but *mcrA* gene copy number showed high positive correlation with CH₄ emission. Rice cultivars showed different CH₄ oxidation potentials, which negatively correlated with CH₄ emission. This result suggested that CH₄ dynamics might be strongly affected by the other factors such as root activities and exudates, which influenced methanogenic and methanotrophic activities during rice cultivation.

Key words : methane emission, rice cultivar, cultivar effect, rice productivity

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