

Effect of Rice Cultivars and Water Regimes Application as Mitigation Strategy for Greenhouse Gases in Paddy Fields

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Abstract : Methane (CH₄) is one of the most dangerous greenhouse gases (GHG) emitted into the atmosphere by terrestrial ecosystems, with a global warming potential (GWP) 25-34 times that of CO₂ on a centennial scale. Paddy rice cultivations are a major source of methane emission and is the major driving force for climate change. Thus, it is necessary to find out GHG emissions mitigation strategies from rice cultivation. A study was conducted at Niigata University. And the prime objective of this research was to determine the effects of rice varieties CH₄ lowland (NU1, YNU, Nipponbare, Koshihikari) and upland (Norin 1, Norin 24, Hitachihatamochi) japonica rice varieties using different growth media which was paddy field soil and artificial soil. The treatments were laid out in a split plot design. The soil moisture was kept at 40-50% and 70%, respectively. The CH₄ emission rates were determined by collecting air samples using the closed chamber technique and measuring CH₄ concentrations using a gas chromatograph. CH₄ emission rates varied with the growth, growth media type and development of the rice varieties. The soil moisture was monitored at a soil depth of 5-10 cm with an HydraGO portable soil sensor system every three days for each pot, and temperatures were recorded by a sensitive thermometer. The lowest cumulative CH₄ emission rate was observed in Norin 24, particularly under 40 to 50% soil moisture. Across the rice genotypes, 40-50% significantly reduced the cumulative CH₄, followed by irrigation of 70% soil moisture. During the tillering stage, no significant variation in tillering and plant height was observed between and 70% soil moisture. This study suggests that the cultivation of Norin 24 and Norin 1 under 70% soil irrigation could be effective at reducing the CH₄ in rice fields.

Keywords : methane, paddy fields, rice varieties, soil moisture

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