Vascular Transport of Methane from Rice Cultivars

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Abstract—*Rice has been playing a crucial role in global food security. In addition to its importance for food security, rice cultivation is also a vital source of greenhouse gas (GHG) methane (CH_4). Rice paddy soils release nearly 15–20% of total methane emitted to the atmosphere. Methane produced in rice paddy soils is emitted to the atmosphere by three pathways: molecular diffusion, ebullition as gas bubbles, and rice-mediated transport. Identification of rice cultivars with high-yield levels and traits contributing to low methane production represents an economical approach. An experiment was conducted at IARI, New Delhi in Kharif (July-November), 2018, with the objectives to quantify the vascular methane transport from rice cultivars. The investigation was carried out in crates of 60*40 cm using 16 rice cultivars in a completely randomized design with three replications. Gas samples were collected by a closed chamber technique, and its analysis was done using gas chromatograph fitted with a flame ionization detector.*

The seasonal integrated methane fluxes ranged from 10.4 to 34.2 kg/ha during the entire rice-growing period. The rice cultivar Nagina-22 showed significantly higher methane emission fluxes followed by pusa-44, CR Dhan 10, PB-1, Type-3, IR-64, IPB-1, Taraori Basmati, PB-1121, MTU-1010, PB-1637, PB-1728, PB-1509, Swarna and Pusa-1612. The minimum emission was recorded in control. The total methane fluxes from rice cultivars were ranged from 1043.1 to 3417.6 mg/m^2/day. Results also indicated that the rice cultivars Nagina-22, Pusa-44, CR Dhan10, PB-1, Type-3, IR-64, IPB-1, Taraori Basmati could be categorized as higher methane emitting varieties. While PB-1121, MTU-1010, PB-1637, PB-1728, PB-1509, Swarna, Pusa-1612 can be categorized as lower methane emitting varieties. As stated, and mentioned above, rice cultivation is vital for food security but also an important source of greenhouse gas (GHG). Therefore, the focus of rice breeding needs a shift towards adaptation to new approach in production systems that can sustain the effects of climate change. The global warming potential can thus be brought in win-win situation by concentrated efforts on varietal selection and management practices in rice.

Keywords: *Rice, cultivars, methane, global warming, climate change.*