Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

AGE04-07 会場:301A 時間:5 月 24 日 11:45-12:00

Interactive effects of EC and pH on nitrous oxide emissions and denitrification
Interactive effects of EC and pH on nitrous oxide emissions and denitrification

HA, Thi kim thanh[1*] ; MAEDA, Morihiro[1]
HA, Thi kim thanh[1*] ; MAEDA, Morihiro[1]

[1]Graduate School of Environmental and Life Science, Okayama University
[1]Graduate School of Environmental and Life Science, Okayama University

Long-term fertilizer applications and saline water irrigation lead to the accumulation of salts and changes in soil pH. These changes may in turn affect N_2O emissions from soil. Interactive effects of EC and pH on N_2O emissions were studied by using paddy soil in Ushimado, Okayama Prefecture, Japan. Closed incubation experiments were conducted in 100-mL glass bottles for 72 h at 25^{o}C. Each bottle contained 5 g of air-dried soil and 25 mL of solution, which includes KNO_3 (10 mg NO_3-N L^{-1}) and NaCl (0 M, 0.005 M, 0.01 M, 0.05 M, 0.1 M, 0.2 M) for adjusting different electric conductivity (EC) levels under different pH: acid (HCl 0.005 M), neutral (no adjustment), and alkaline ($NaHCO_3$ 0.005 M). Nitrous oxide concentration in the headspace of the bottle was measured 3 h, 24 h, 48 h, and 72 h after incubation with gas chromatograph (GC-8A, Shimadzu, Kyoto, Japan). After gas collection, the solution was taken out for measuring pH, EC and concentrations of NH_4^+ and NO_3^-. Results indicated that pH was a significant factor controlling N_2O emissions (P <0.05). Nitrous oxide emissions were greater in higher EC treatments under the acid treatment. Nitrous oxide emissions peaked at 24 h of incubation and fell sharply afterwards due to further dentrification process. At 24 h, the highest N_2O emissions was measured in 0.2 M NaCl (7.5 mg kg $soil^{-1}$), followed by in 0.1 M, 0.05 M, 0.01 M, 0.005 M and 0 M treatments, which were 6.7, 5.1, 3.8, 2.0, and 1.2 mg N kg $soil^{-1}$, respectively. Nitrous oxide reductase was sensitive to both high EC and low pH condition. In neutral and alkaline treatments, there was no significant effect of EC on N_2O emissions during 72 h incubation (P >0.05). The N_2O emissions were 0 mg kg $soil^{-1}$ at 3 h after incubation then ranged from 0.02 to 0.11 mg N kg $soil^{-1}$. Ammonium concentration increased over the incubation periods. Higher EC promote NH_4^+ release. There was no significant difference in NO_3^- removal among treatments at different EC levels (P >0.05). We conclude that low pH increased N_2O emissions and higher EC under acid conditions promoted N_2O emissions.

キーワード: Denitrification, EC, nitrous oxide, paddy soil, pH
Keywords: Denitrification, EC, nitrous oxide, paddy soil, pH