

OS-01

# Effect of Nitrate on Iron Reduction and Phosphorus Release in Flooded Paddy Soil
# (논토양에서 질산 이온이 철의 환원과 인의 용출에 미치는 영향)

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The increase in P availability to rice under flooded soil conditions involves the reductive dissolution of iron phosphate and iron (hydr)oxide phosphate. However as $NO_3^-$ is a more favourable electron acceptor in anaerobic soils than Fe, high $NO_3^-$ loads function as a redox buffer limiting the reduction of Fe. The effect of adding $NO_3^-$ on Fe reduction and P release in paddy soil was investigated. Pot experiment was conducted where $NO_3^-$ was added to flooded soil and changes of redox potential and $Fe^{2+}$, $NO_3^-$, and $PO_4^{3-}$ concentrations in soil solution at 10 cm depth were monitored as a function of time. Redox potential decreased with time to −96 mV, but it was temporarily poised at about 330~360 mV when $NO_3^-$ was present. Nitrate addition to soil led to reduced release of $Fe^{2+}$ and prevented the solubilization of P. Phosphate in pore water began to rise soon after incubation and reached final concentrations about 0.82 mg P/L in the soil without $NO_3^-$ addition. But, in the soil with $NO_3^-$ addition, $PO_4^{3-}$ in pore water was maintained in the range of 0.2~0.3 mg P/L. The duration of inhibition in $Fe^{2+}$ release was closely related to the presence of $NO_3^-$, and the timing of $PO_4^{3-}$ release was inversely related to the $NO_3^-$ concentration in soil solution. The results suggest that preferential use of $NO_3^-$ as an electron acceptor in anaerobic soil condition can strongly limit Fe reduction and P solubilization.

Key words : nitrate, iron, phosphate, paddy soil, oxidation-reduction
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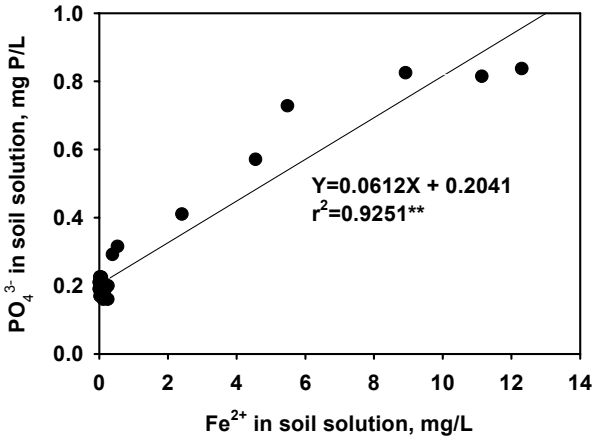


Figure. Relationship between iron reduction and phosphorus solubilization in flooded paddy soil.