

Effect of Alternate Wetting and Drying on Nitrogen Dynamic in Low Land Paddy Soil

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Low land paddy cultivation requires relatively higher amount of water. The nitrogen dynamics in low land paddy can be affected by climatic and agronomic factors individually or in combination. In order to understand the effect of these factors and to reduce the complexity of field conditions, a controlled experiment was carried out. An experiment was designed to identify the impact of alternative wetting and drying (AWD) cycles with different drying periods on the variation of NO_3^- -N and NH_4^+ -N using a physical model (Lysimeter) together with simulations using Hydrus-1D. The experiment was conducted with following treatment combinations for 98 days. The data were analyzed using complete randomized design with three replicates. 4 days dry spell (D_4), 12 days dry spell (D_{12}), 20 days dry spell (D_{20}) and 4 days dry spell with plant (D_{4p}) were arranged using complete randomized design with three replicate to clarified the effect of length of dry spells and the plant on nitrogen. NH_4^+ -N showed a decreasing trend over the study period in all treatments. On the other hand, NO_3^- -N increased in leachate with time. The NO_3^- -N loss in the leachate was higher than NH_4^+ -N regardless of the length of the AWD cycles. With the presence of paddy, the nitrogen retention and leaching loss was low. Therefore, the irrigation interval would have to be decided along with the rainfall variability to reduce the nitrogen loss in paddy field. The Hydrus-1D could be used to simulate the impact of AWD on NO_3^- -N loss. The measured and the simulated concentration of NO_3^- -N correlated with R^2 values of 0.89, 0.79, 0.74 and 0.69 for D_4 , D_{12} , D_{20} and D_{4p} , respectively. The NO_3^- -N loss in the leachate was higher than NH_4^+ -N regardless of the length of the AWD cycles. The length of the dry spells up to 12 days did not show significant variation in nitrogen loss in this study compared to 20 days dry spell. Therefore, the irrigation interval has to be decided along with the rainfall variability to reduce the nitrogen loss in paddy field.

Key words: Alternate wetting and drying, Hydrus -1D, Nitrogen, NH_4^+ -N, Paddy