

# Dominant factor of the N loss through denitrification in rhizosphere of submerged rice

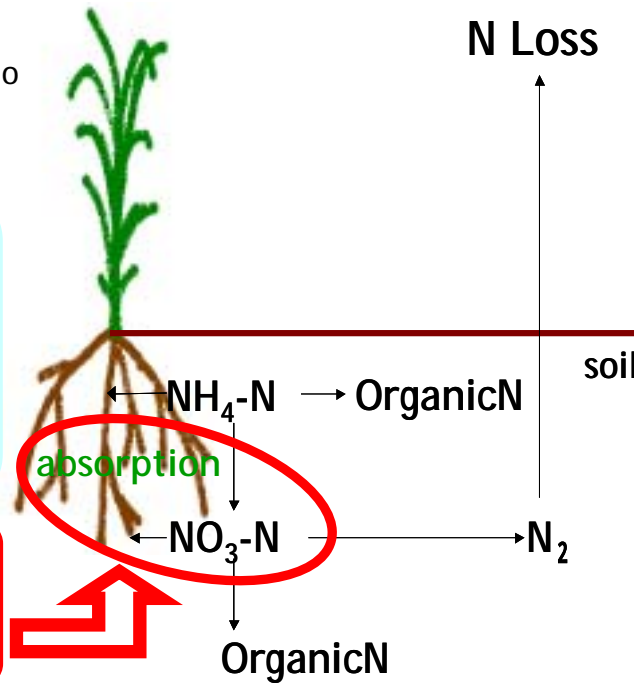
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## Introduction

Rice roots have the unusual feature of transporting atmospheric O<sub>2</sub> through the stem to the roots, and subsequently use this oxygen to oxidize various ions in the rhizosphere. In a previous study (Kakuda et al. 2000), we observed little N loss from the rhizosphere as a result of denitrification during the middle growth stages of rice. Plant N uptake would play an important role in reducing N loss in the rhizosphere of submerged rice.

## Hypothesis

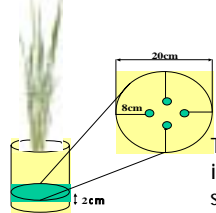
Absorption of NO<sub>3</sub>-N produced in the vicinity of the roots would reduce N losses through denitrification in the rhizosphere at the panicle formation stage.



## Materials and Methods

- A pot (4 L) experiment with five replications
- Rice cultivar: Haenuki

- Soil: Taken from the plow layer of a paddy soil at the Yamagata University farm in Japan
- Top-dressing: A mixed solution of <sup>15</sup>N-labeled (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> and KNO<sub>3</sub>



The N solution (40mg-N·pot<sup>-1</sup>) was injected by syringe at 4 positions in the soil at panicle formation stage.

Treatments

	NO <sub>3</sub> -N	NH <sub>4</sub> -N
	mgN·pot <sup>-1</sup>	
0ni	0	40
15ni	6	34
30ni	12	28
45ni	18	22
60ni	24	16
100ni	40	0

## Results

Nitrogen balance for rice pot experiments applied NH<sub>4</sub>-N and NO<sub>3</sub>-N

Treatments	Absorbed N	Immobilized N	Exchangable N	Recovered N	N lost
	mgN·pot <sup>-1</sup>				
0ni	36.4 (91)	4.0(10)	N.D	40.4(101)	-0.4
15ni	37.1 (93)	4.2(11)	N.D	41.3(103)	-1.3
30ni	30.8(77)	8.5(21)	N.D	39.3(98)	0.7
45ni	31.0(78)	6.4(16)	N.D	37.5(94)	2.6
60ni	31.0(78)	7.5(19)	N.D	38.4(96)	1.6
100ni	23.1(58)	10.0(25)	0.1	33.2(83)	7.8

Numbers in parentheses represent the percentage of fertilizer-N recovery.

## Conclusion

- Absorption of NO<sub>3</sub>-N by the plants significantly reduced N loss through denitrification at the panicle formation stage.
- Assuming that nitrification occurs in the rhizosphere of the 0NI treatment, the rate of N nitrified may be no more than 30% of the applied N.
- The physiological traits of the roots are a dominant factor in N loss from the rhizosphere.