

# Uptake and Partition of <sup>15</sup>N Labeled Fertilizer by Nitrogen Rate and Cultivar in Rice

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## Abstract

This study was conducted to investigate absorption and partition of nitrogen for improvement in efficiency of nitrogen. This experiment was carried out with two cultivars, Hwasungbyeo and Dasanbyeo (semi-dwarf) in paddy field. The levels of N treatments were 60, 120, 180 kg N per ha. Microplots (0.81m<sup>2</sup>) were established for <sup>15</sup>N labeled fertilizer application. Nitrogen utilization differences between the two cultivars were associated with total nitrogen uptake and partitioning after heading. The ability to absorb soil nitrogen through the grain filling period contributed to the increased yield of Dasanbyeo.

## Media summary

This experiment was carried out with two rice cultivars, Hwasungbyeo and Dasanbyeo (semi-dwarf). Nitrogen utilization differences between two cultivars were associated with total nitrogen uptake and partitioning after heading. The ability to absorb soil nitrogen through the grain filling period contributed to the increased yield of Dasanbyeo.

## Key Words

Rice, Hwasungbyeo, Dasanbyeo, <sup>15</sup>N, Nitrogen, Uptake

## Introduction

In rice semi-dwarf cultivars bred for high grain yield have higher nitrogen use efficiencies than tall cultivars at high nitrogen application rate. Research on cultivars differing in plant type often shows differences in nitrogen uptake and use efficiency (Guindo *et al.*, 1994). Accordingly, this study was conducted to investigate nitrogen absorption and partitioning by <sup>15</sup>N labeled fertilizer between the different plant types of rice (*Oryza sativa* L.).

## Material and Methods

This experiment was carried out with two rice cultivars, Hwasungbyeo and Dasanbyeo in a paddy field. Hwasungbyeo (Suwon330) is a tall (culm length 82 cm), medium maturing variety, while Dasanbyeo (Suwon405) is a semi-dwarf (73 cm), medium maturing and high yielding variety. The N treatments were 60, 120, 180 kg N per ha. Microplots (0.81m<sup>2</sup>) were established for <sup>15</sup>N labeled fertilizer (urea) application. Total nitrogen and <sup>15</sup>N contents were determined by stable isotope mass spectrometer (Isoprime-EA, Micromass) at the National Instrumentation Center for Environmental Management (NICEM), Seoul National University, Korea.

## Results

At all N rates, Dasanbyeo exhibited an improved harvest index over Hwasungbyeo. Nitrogen uptake and accumulation in leaf blade and whole plant continued after heading in Dasanbyeo (Data not shown). Nitrogen utilization differences between the two cultivars were associated with nitrogen uptake and partitioning after heading. (Table 1). Yoshida (1981) reported that nitrogen absorption after heading would assume increased importance when high yields were achieved by increasing the harvest index. In Dasanbyeo, the ability to absorb soil nitrogen through the grain filling period contributed to high harvest index and yield.

**Table 1. Nitrogen derived from fertilizer at heading and harvest in paddy field**

N fertilizer rate (kg/ha)		Nitrogen derived from fertilizer (g/hill)					
		Hwasungbyeo			Dasanbyeo		
		Heading	Harvest	Increment	Heading	Harvest	Increment
60	Basal	0.03	0.05		0.03	0.05	
	TS	0.02	0.02		0.02	0.02	
	PIS	0.03	0.04		0.02	0.04	
	TNDFF	0.08	0.11	0.03	0.07	0.11	0.04
	Soil	0.36	0.57	0.21	0.33	0.54	0.21
	TN	0.44	0.68	0.24	0.40	0.65	0.25
120	Basal	0.14	0.18		0.11	0.12	
	TS	0.09	0.09		0.07	0.08	
	PIS	0.16	0.10		0.07	0.09	
	TNDFF	0.39	0.37	0.00	0.25	0.29	0.04
	Soil	0.45	0.64	0.19	0.37	0.77	0.40
	TN	0.84	1.01	0.17	0.62	1.06	0.44
180	Basal	0.10	0.23		0.23	0.21	
	TS	0.11	0.11		0.09	0.14	
	PIS	0.09	0.15		0.18	0.15	
	TNDFF	0.30	0.49	0.19	0.50	0.50	0.00

Soil	0.67	0.87	0.20	0.27	0.82	0.55
TN	0.97	1.36	0.39	0.77	1.32	0.55

TS: Tillering stage PIS: Panicle initiation stage TNDF: Total nitrogen derived from fertilizer TN: Total nitrogen

### Conclusion

We could estimate that N uptake and translocation from root after heading contributed to high grain yield of Dasanbyeo. So it would be needed to study for improvement of root biomass and vigor after heading in high yielding variety like Dasanbyeo.

### References

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