

Temporal and Spatial Variation of Soil Inorganic Nitrogen in Relation to Plant Growth under Large Scale Paddy Fields With and Without Fertilization

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Objective

This research was carried out to investigate plant growth response to temporal and spatial variation of soil inorganic nitrogen under fertilized and non-fertilized paddy fields in Korea. The obtained data in this research will also be used to confirm the analysis of spatial variation of rice yield response to soil chemical properties in previous research that was conducted in the same experimental field.

Materials and Methods

A large paddy field of 59m×110m (divided into 65 plots with 10m×10m) without fertilizer application and 60m×110m (divided into 66 plots with 10m×10m) with fertilizer application located in experimental farm, RDA, Korea were used for the research. Soil inorganic nitrogen samples for each corresponding plot was collected at transplanting, panicle initiation and heading stage for its analysis of chemical properties. The measurement of vegetative growth and grain yield of each corresponding plot were also investigated throughout the plant growth stages.

Result and Discussion

The coefficient of variation (C.V) for soil inorganic nitrogen in fertilized-field at transplanting, panicle and heading stages are relatively higher than in non-fertilized field (Tab.1.). Fertilized field also showed greater spatial variation in terms of vegetative growth (Tab. 2&3). The spatial variation of soil inorganic nitrogen was significantly correlated to plant growth (Fig.1.2.3 and 4), especially, plant nitrogen and SPAD value at panicle and heading stages, respectively. Gain yield is expected to take into account for the analysis of its response to soil chemical properties of current and previous research.

Table 1 Descriptive statistics of soil inorganic nitrogen (mg/kg⁻¹) at transplanting, panicle initiation and heading stage (Field A: non-fertilized field and Field B: fertilized field)

Sampling stage	-----Field A-----					-----Field B-----				
	Min	Max	Mean	STD	C.V.	Min	Max	Mean	STD	C.V.
Transplanting	0.81	7.61	3.82	1.18	30.8	3.59	20.7	11.8	3.84	32.5
Panicle initiation	1.1	12.7	4.09	1.59	36.6	2.51	28.0	15.8	6.6	41.7
Heading	1.3	7.7	4.8	1.5	31.2	3.02	14.6	7.5	2.49	33.2

Table 2 Descriptive statistics of plant nitrogen and vegetative growth at panicle initiation stage (Field A: non-fertilized field and Field B: fertilized field)

Variable	-----Field A-----					-----Field B-----				
	Min	Max	Mean	STD	C.V.	Min	Max	Mean	STD	C.V.
Plant nitrogen (%)	1.15	2.29	1.62	0.23	14.1	1.24	2.14	1.53	0.27	17.6
SPAD	24.4	34.2	27.3	1.65	6.0	24.4	36.8	30.2	2.12	11.3
Tiller No.	8.0	16.0	11.7	1.61	13.7	13.8	23.6	18.7	2.35	12.5
Dry weight (g/hill)	2.4	9.0	4.45	1.30	29.2	7.0	17.6	11.0	2.40	21.8

Table 3 Descriptive statistics of plant nitrogen and vegetative growth at heading stage
(Field A: non-fertilized field and Field B: fertilized field)

Variable	-----Field A-----					-----Field B-----				
	Min	Max	Mean	STD	C.V.	Min	Max	Mean	STD	C.V.
Plant nitrogen (%)	0.81	1.27	1.03	0.09	8.7	0.92	1.65	1.18	0.16	13.5
SPAD	25.7	34.0	29.2	1.94	6.6	25.9	40.5	33.6	3.09	9.2
Tiller No.	9.0	20.0	13.0	1.8	13.8	9.0	21.0	15.5	2.66	17.1
Dry weight (g/plant)	24.6	44.9	31.9	4.3	13.1	30.6	58.4	43.7	6.67	15.2

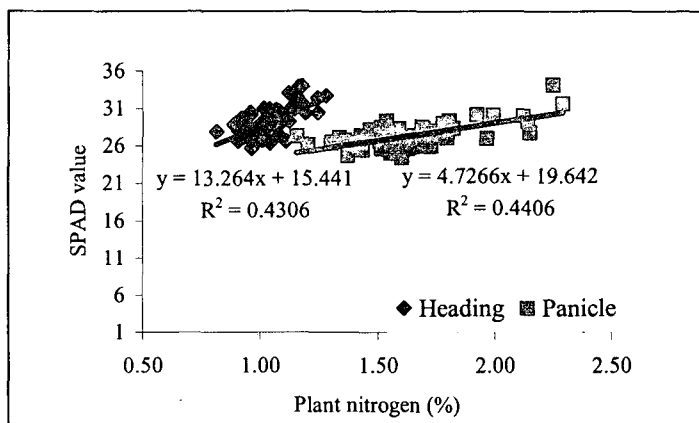


Fig.1 Relationship between plant nitrogen and SPAD value at panicle initiation and heading stages of non-fertilizer field

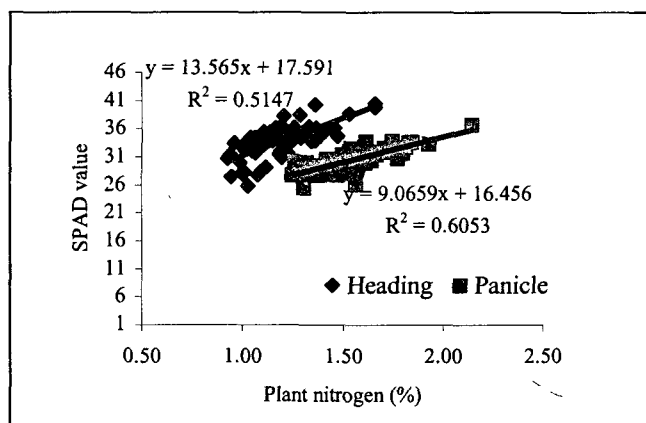


Fig.2 Relationship between plant nitrogen and SPAD value at panicle initiation and heading stages of fertilized field

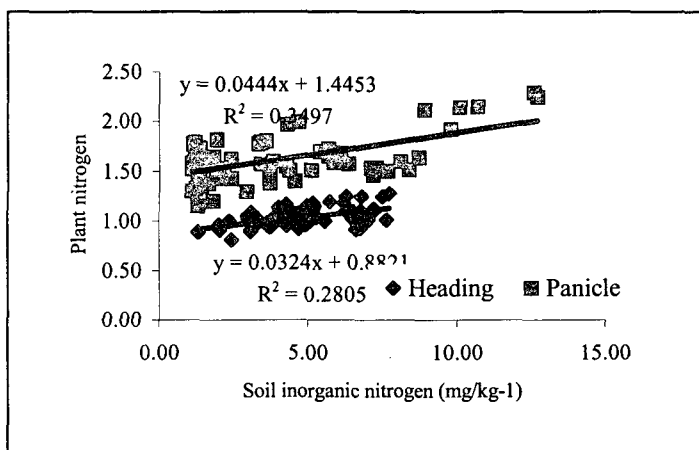


Fig.3 Relationship between soil inorganic nitrogen and plant nitrogen at panicle initiation and heading stages of non-fertilized field

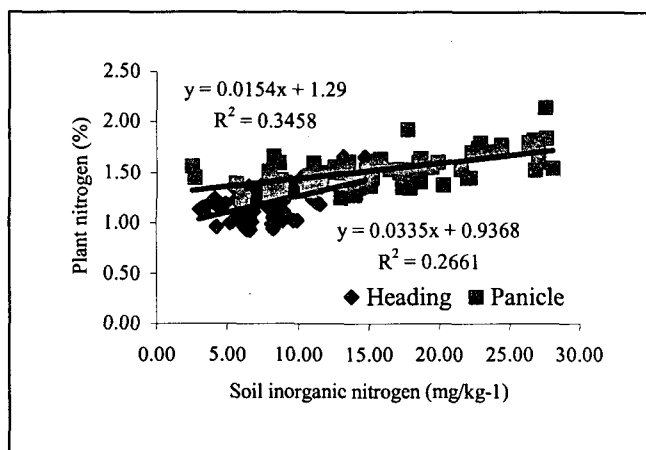


Fig.4 Relationship between soil inorganic nitrogen and plant nitrogen at panicle initiation and heading stages of fertilized field