

## **P2. Nitrogen and Seedbed Effects on Growth Responses, Utilization of Mineral Nutrients, and Use Pattern of Carbohydrates with Different Seedbed Soils at Rice Seedling for Machine Transplanting**

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### **Introduction**

This study was conducted not only to develop new seedbed of rice seedling, but also to examine the effects of the developed seedbed, comparing to those of the red earth soil and the commercial seedbed soil, through investigating the plant growth responses, mineral uptake, storage and utilization of carbohydrates in plant tissues.

### **Materials and Methods**

#### **1. Plant materials and growth conditions**

Two varieties of rice were used, one was Dasanbyeon selected for Indica x Japonica type and the other was Seoanbyeon for Japonica type. Seeding amount per seedbed was 180g. After sprouting to about 1.5cm height, seedbeds were moved to the seedling shelf(five floor) in the greenhouse. Two different seedbeds, the red earth soil(commonly used) and the developed seedbed(the mixture with vermiculite and waste of paper industry), were used and three different N levels, 0, 2, 3g per box, were treated.

#### **2. Growth analysis and tissue sampling**

plant height was measured everyday from 5th day after putting the seedbeds on the seedling shelf. Fresh and dry weight were measured at major seedling growth stages with sampling 100 plants. The seedling quality was calculated with using the dry weight and plant height. Each plant tissue of growth zone, emerging leaf, leaf blades, and sheaths, was separated and sampled to determine the content of mineral nutrients and carbohydrates.

#### **3. Analysis of mineral nutrients and carbohydrates**

Total-N was determined with Indole-phenol blue method, phosphate with Vandate method, and others with ICP after the digestion. Carbohydrates determined with Anthrone procedure.

### **Results**

- 1. Plant height of two rice varieties was increased rapidly to 11 days after seeding, and then increased slowly. Comparing the plant height with different N levels, plant height was the tallest in 3g N per box compared to those of other N levels. Dry weight per 100 rice seedling and seedling quality were much better in 3g N per box than those of other N levels. Rice seedling could be divided into two stages throughout the seedling stage; One is the growth stage of plant height until 11days after seeding and the other the growth stage of seedling quality since 11days after seeding.**
- 2. Contents of mineral nutrients of rice seedling showed that N, K, Mg and Mn were increased with raising the application amount of nitrogen, while P, Fe, Zn and Cu were not influenced by the application amount of nitrogen.**
- 3. Contents of water soluble carbohydrates in tissues of rice seedling were higher in ordering of the growth zone, sheath, immatured leaf blade, and matured leaf blade.**

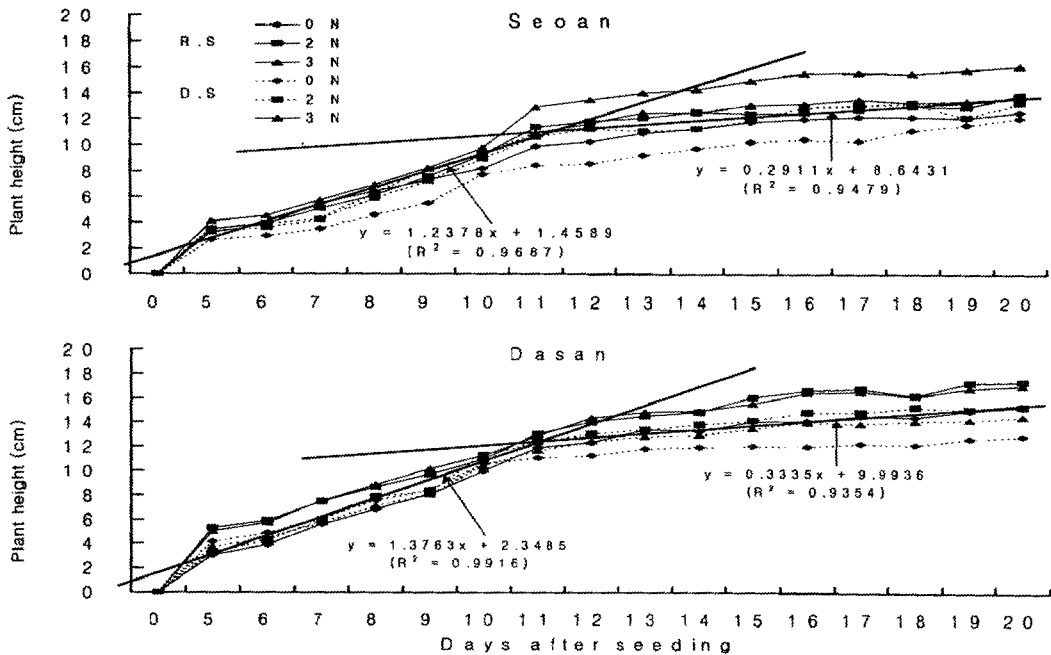


Fig 1. Change of plant heights of the rice seedling of two rice varieties grown with two seedbeds and three N levels.(R.S.: Red earth(loam), D.S.: Developed Seedbed)

Table 1. Contents of mineral nutrients of rice seedling of two rice varieties at 20 days after seeding with two seedbeds and three N levels.

Variety	Seedbed	N level	Contents of mineral nutrients							
			N	P	K	Mg	Mn	Fe	Zn	Cu
		g/box	%							
Seoan	R.S.	0	1.64	1.03	2.17	3.42	0.07	0.04	56	48
		2	2.01	0.99	3.04	3.40	0.08	0.05	64	68
		3	1.92	1.11	3.56	4.35	0.12	0.06	66	59
		Mean	1.85	1.05	2.92	3.73	0.09	0.05	62	58
	D.S.	0	1.79	1.26	3.44	4.44	0.02	0.03	66	72
		2	2.16	1.28	2.77	3.14	0.02	0.05	54	64
3		2.10	1.13	2.82	2.93	0.02	0.04	63	63	
	Mean	2.01	1.22	3.01	3.51	0.02	0.04	61	66	
Dasan	R.S.	0	1.76	0.98	1.81	2.92	0.09	0.08	56	65
		2	1.92	0.87	2.33	2.87	0.09	0.05	63	67
		3	2.38	0.89	1.93	2.98	0.09	0.06	69	52
		Mean	2.02	0.90	2.03	2.92	0.09	0.06	63	61
	D.S.	0	2.20	1.16	2.51	2.84	0.02	0.05	62	53
		2	2.58	1.30	2.98	2.97	0.02	0.04	84	81
3		2.43	1.39	3.32	3.63	0.02	0.04	51	68	
	Mean	2.40	1.28	2.93	3.14	0.02	0.04	65	67	
F-value	Var		145.26**	5.81*	621.01**	923.67**	NS	256**	NS	NS
	Seedbed		142.95**	340.57**	646.68**	NS	16129**	676**	NS	19.13**
	V×S		23.38**	42.94**	441.51**	135.59**	NS	100**	NS	NS
	Nitro		94.41**	NS	163.98**	148.37**	163**	7**	5.34*	18.47**
	V×N		8.66*	3.58*	37.43**	154.91**	217**	373**	13.97**	3.92*
	S×N		11.88**	8.65**	156.29**	170.67**	217**	73**	12.02**	NS
	V×S×N		18.35**	27.37**	396.09**	575.78**	163**	19**	17.74**	30.39**

NS: non-significant; \*: significant at P < 0.05; \*\*: at P < 0.01.