Methods of Nitrogen Application and Enhancing High Density Grains in Two Rice Cultivars

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벼 고밀도종자 증진을 위한 질소 시용 방법

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Objective: To study the effect of nitrogen(N) application methods on the enhancing high density grains in rice

Materials and Methods

Cultivars: 1R58, Shinunbongbyeo

Source: ammonium sulfate, 21%

application methods:

1. Levels: Fertilizer was applied at 0, 2, 4, 8g/pot containing 3,5kg soil (4g standard)
2. Topdressing: The factors were two N levels for topdressing (1 and 2g/pot), and five topdressing stages from 10days to 50days after transplanting.
3. Split application: Fertilizer was applied 120kg/ha. Six split applications were applied at basal, tillering stage, necknode differentiation stage and heading stage (%, 25-25-25-25, 30-20-30-20, 30-30-40-0, 50-20-20-10, 70-0-20-10, 100-0-0-0)

Grain density samples were graded according to their specific gravity:

very poor grain(<1.00), poor grain (1.00-1.06), average grain(1.08-1.14, good grain(1.16-1.20) and high density grain (>1.20)

Results and Discussion

1. High density grains of 1R58 significantly increased from fertilizer free to added N4 but decreased with further increase in level of N. In Shinunbongbyeo, good density grain was significantly increased with increaseing N4 level.
2. The number of high density grains was increased by topdressing at 40 to 50 days after transplanting.
3. High density grain significantly increased with N split application compard to basal treatment.
4. The grain width, thickness and 1,000 grain weight of the two cultivars increased with increasing grain density but was more pronounced in Shinunbongbyeo.
5. The weight of 1,000 grain was significantly and positively correlated with length, width and thickness of grain.

Table 1. Ratio of grain weight at different grain density grades with four nitrogen levels in IR58 and Shinunbongbyeo

Cultivars	N-levels (g/pot)	Grain density(%)				
		Very poor	Poor	Average	Good	High
IR58	0	9.0	2.1	5.0	80.9	3.0b
	2	9.5	1.7	5.3	80.5	3.6b
	4	5.8	1.3	4.0	81.6	7.5a
	8	4.7	1.5	5.8	84.6	3.2b
Shinunbongbyeo	0	6.5b	5.5a	23.9a	64.2b	0
	2	15.3a	5.3a	22.0a	57.4c	0
	4	7.7b	3.1b	11.5b	77.7a	0
	8	11.4ab	2.2b	13.2b	73.2a	0

Means followed by a common letter in a column are not significantly different at the 5% level by DMRT.

Table 2. Ratio of grain weight at different grain density grades with topdressing of nitrogen in IR58 and Shinunbongbyeo.

N topdressing		Grain density (%)									
		Very poor		Poor		Average		Good		High	
Time (DAT)	Rate (g/pot)	IR58	Shinun-bongbyeo	IR58	Shinun-bongbyeo	IR58	Shinun-bongbyeo	IR58	Shinun-bongbyeo	IR58	Shinun-bongbyeo
Control		3.4	6.7a	2.0a	2.6a	3.7	8.9c-e	86.5	81.8bc	4.5b-d	0
10	1.0	1.3	3.2ab	0.4b	1.7ab	2.2	9.5b-e	91.3	85.6a-c	4.8a-d	0.1
10	2.0	2.6	6.3a	0.7ab	2.5a	1.3	13.8ab	91.5	77.2c	3.6cd	0
20	1.0	2.0	5.2ab	0.5b	0.8bc	1.5	9.9b-e	93.0	84.0a-c	3.1d	0
20	2.0	1.7	5.0ab	0.7ab	2.2a	1.3	14.4 a	93.3	78.4c	2.9d	0.1
30	1.0	2.1	3.8ab	0.8ab	1.6ab	2.1	16.3a	91.1	78.0c	3.8b-d	0.1
30	2.0	2.9	4.1ab	0.6b	1.4a-c	2.7	11.9a-d	88.4	82.4a-c	5.4a-c	0.1
40	1.0	1.7	5.9a	0.3b	1.8ab	0.9	12.6a-c	92.0	79.7bc	5.4a-c	0
40	2.0	1.9	6.3a	0.6b	2.4a	1.9	13.5ab	90.9	77.8c	4.7a-d	0.1
50	1.0	2.2	4.3ab	1.0ab	1.7ab	1.1	6.7e	90.1	87.3ab	5.7ab	0.1
50	2.0	1.8	2.0b	0.5b	0.2c	1.0	7.9de	90.8	89.6a	6.0a	0.3

Means followed by a common letter in a colum are not significantly different at the 5% level by DMRT.

Table 3. Ratio of grain weight at different grain density grades with various split application of nitrogen in IR58 and Shinunbongbyeo.

Split application treatment	Grain density(%)									
	Very poor		Poor		Average		Good		High	
	IR58	Shinun-bongbyeo	IR58	Shinun-bongbyeo	IR58	Shinun-bongbyeo	IR58	Shinun-bongbyeo	IR58	Shinun-bongbyeo
25-25-25-25	2.0	2.3b	0.4b	1.0b	1.5	11.9	90.2a	84.3	5.8c	0.0
30-20-30-20	2.1	2.7b	0.3b	1.2b	1.5	11.5	85.7b	84.3	10.5bc	0.2
30-30-40- 0	2.5	2.4b	0.5b	0.7b	3.2	12.3	85.1b	84.5	8.7bc	0.1
50-20-20-10	1.8	2.1b	0.3b	1.5b	1.4	11.9	80.6bc	84.4	14.0b	0.1
70- 0-20-10	1.6	2.1b	0.3b	1.0b	0.9	11.0	72.6c	85.8	24.7a	0.2
100- 0- 0- 0	2.4	8.0a	1.8a	2.6a	3.5	11.0	86.0b	78.3	6.2c	0.1

Means followed by a common letter in a colum are not significantly different at the 5% level by DMRT.

Table4. Correlation coefficients between 1000 grain weight and thickness, width and length of grain in IR58 and Shinunbongbyeo.

Characters	Correlation coefficient	
	IR58	Shinunbongbyeo
Grain length	0.931°°	0.931°°
Grain width	0.900°	0.879°
Grain thickness	0.950°	0.995°°