

窒素分施方法이 水稻의 維管束發育에 미치는 影響

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Split Application of Nitrogen and Development of Vascular Bundles in Rice

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Objective :

A field experiment was conducted using different split applications of nitrogen to determine their effect on the number and cross sectional area of the large vascular bundles(LVB) and small vascular bundles(SVB) in the rice plant and possible implication on grain yields.

Materials and Methods :

Experiment site : IRRI experimental farm

Cultivars : IR58(indica), Unbong 7(japonica)

Sowing and transplanting date : November 17 and December 2, 1989

Fertilizer application : N - P₂O₅ - K₂O (120-40-40kg/ha)

N split application treatments : basal-tillering stage-necknode differentiation-

heading (% , 25-25-25-25, 30-20-30-20, 30-30-40-0, 50-20-20-10, 70-0-20-10, 100-0-0-0)

Experimental design : strip plot design with 3 replications

Results and Discussion :

1. The number and cross sectional area of LVB in the peduncle were higher in split application of N (30-30-40-0) than in basal (100-0-0-0) treatment.
2. High N split application at panicle initiation stage can result in better development of VB in the peduncle, flag leaf blade and leaf sheath.
3. The total cross sectional area of LVB in peduncle was highly correlated with number of spikelets.
4. The number of high density grains significantly increased with N split application (50-20-20-10 and 70-0-20-10) in IR58. High grain yield at 70-0-20-10 was the result of high density grains.

Table 1. Number and cross sectional area of large (LVB) and small (SVB) vascular bundles in the petiole as affected by split application of nitrogen in 1958 and 1959.

SPLIT APPLICATION TREATMENT (2)	NUMBER OF VB		AREA OF VB ($\times 10^{-3} \text{ cm}^2$)	
	LVB (1958)	SVB (1959)	LVB (1958)	SVB (1959)
25-25-25-25	21.7 b	11.0	20.3	25.0
30-20-30-20	21.3 b	11.7	22.3	23.3
30-30-40-0	23.7 a	11.7	24.7	24.7
50-20-20-10	23.0 b	12.0	21.0	24.0
70-0-20-10	22.3 b	12.0	23.0	24.0
100-0-0-0	21.3 b	11.3	21.0	23.7

F-value	Cultivar	19.06 ns	20.21 **	0.76 ns	16.54 **
	N split application	3.67 *	0.91 ns	2.08 ns	0.72 ns
	Interaction	2.21 ns	0.72 ns	0.27 ns	0.24 ns

*, ** means are significantly different at 5% and 1% level, respectively. Means followed by a common letter in a column are not significantly different at the 5% level by DRT.

Table 2. Number and cross sectional area of large (LVB) and small (SVB) vascular bundles in the flag leaf blade of the main culm as affected by split application of nitrogen in 1958 and 1959.

SPLIT APPLICATION TREATMENT (2)	NUMBER OF VB		AREA OF VB ($\times 10^{-3} \text{ cm}^2$)	
	LVB (1958)	SVB (1959)	LVB (1958)	SVB (1959)
25-25-25-25	16.0	14.3	64.0 b	62.0
30-20-30-20	16.3	15.0	68.3 a	62.3
30-30-40-0	17.0	15.0	70.0 a	56.7
50-20-20-10	17.0	14.7	65.3 ab	57.0
70-0-20-10	17.0	14.7	66.7 ab	58.7
100-0-0-0	15.3	14.0	61.0 b	56.3

F-value	Cultivar	64.80 **	30.27 **	20.65 **	9.24 ns
	N split application	1.40 ns	2.40 ns	2.66 *	1.80 ns
	Interaction	0.48 ns	2.07 ns	3.14 *	0.21 ns

*, ** means are significantly different at 5% and 1% level, respectively. Means followed by a common letter in a column are not significantly different at the 5% level by DRT.

Table 3. Ratio of grain weight at different grain density grades with various split application of nitrogen in 1958 and 1959.

SPLIT APPLICATION TREATMENT (2)	VERY POOR		POOR		AVERAGE		GOOD	
	1958	1959	1958	1959	1958	1959	1958	1959
25-25-25-25	2.0	2.3 b	0.4 b	1.0 b	1.5	11.5	50.2	64.3
30-20-30-20	2.1	2.7 b	0.3 b	1.2 b	1.5	11.5	49.7	64.3
30-30-40-0	2.5	2.4 b	0.5 b	0.7 b	3.2	12.3	45.1	64.5
50-20-20-10	1.8	2.1 b	0.3 b	1.5 b	1.4	11.9	40.6	64.4
70-0-20-10	1.6	2.1 b	0.3 b	1.0 b	0.9	11.0	72.6	65.8
100-0-0-0	2.4	8.0 a	1.8 a	2.6 a	3.5	11.0	46.0	76.3

F-value	Cultivar	16.37 **	13.51 **	63.18 **	0.03 ns
	N split application	12.34 **	7.34 ns	1.83 ns	7.20 ns
	Interaction	8.08 ns	0.59 ns	0.14 ns	3.09 *

*, ** means are significantly different at 5% and 1% level, respectively. Means followed by a common letter in a column are not significantly different at the 5% level by DRT.

Table 4. Yield and yield components as affected by split application of nitrogen in 1958 and 1959.

SPLIT APPLICATION TREATMENT (2)	PANICLE (no./m ²)		SPYLET (no./panicle)		FERTILITY (%)		1000 GRAIN WEIGHT (mg)		GRAIN YIELD (t/ha)	
	1958	1959	1958	1959	1958	1959	1958	1959	1958	1959
25-25-25-25	356.0 d	342.0 d	71.5 d	71.8 a	89.3 a	91.2 a	24.3 c	24.8 b	5.13 ab	4.51 b
30-20-30-20	352.0 d	349.3 d	76.3 a	72.3 a	88.1 a	90.1 ab	24.4 bc	24.8 b	5.13 ab	4.68 ab
30-30-40-0	370.0 cd	364.3 cd	81.9 *	76.1 a	85.6 ab	89.0 ab	24.1 c	24.5 bc	5.41 ab	5.05 a
50-20-20-10	390.7 bc	383.7 bc	82.2 a	76.4 a	87.8 a	87.5 ab	25.0 a	25.5 a	5.66 ab	5.12 a
70-0-20-10	406.7 ab	403.7 ab	79.5 a	72.7 a	87.7 a	88.9 ab	24.8 ab	25.4 a	5.59 a	5.08 a
100-0-0-0	423.0 a	419.0 a	70.0 b	64.4 b	82.3 b	86.4 b	27.6 d	26.1 c	5.34 b	4.34 b

F-value	Cultivar	1.47 ns	28.39 **	9.07 **	31.68 **
	N split application	22.87 **	31.45 **	5.31 **	23.57 **
	Interaction	0.12 ns	0.15 ns	0.72 ns	0.16 ns

*, ** means are significantly different at 5% level. Means followed by a common letter in a column are not significantly different at the 5% level by DRT.