

3. Effect of Timing of Nitrogen Application on Rice (1976)

Hitoshi TAKAHASHI
Vichien SASIPRAPA

According to the observation so far made on the field, the applied nitrogen quickly affects the rice growth. This suggests the importance of the timing of nitrogen application for the efficient utilization of fertilizer. The experiment was conducted to clarify the effect of nitrogen application time for the better crop of rice.

Materials and method

- (1) Test field: Mungbean was grown from early March to late May in the field.
- (2) Variety used: RD 7
- (3) Transplanting time: August 17, 1976 (21 day seedling)
- (4) Fertilizer application:

Treatment No.	A	Time B	C	
1	0	0	0	A: basal dressing at the rooting time (Aug. 24)
2	0	0	20	B: top dressing at the initial stage of young panicle formation (Sept. 28; 25 days before flowering)
3	0	20	0	
4	0	20	20	
5	20	0	0	C: top dressing at the booting stage (Oct. 14; 9 days before flowering)
6	20	0	20	
7	20	20	0	
8	20	20	20	
②	0	0	40	Figures such as 20, 40 and 13 in the table show the amount of nitrogen in Kg/ha.
③	0	40	0	25 Kg per hectare of P ₂ O ₅ was uniformly applied as a basal dressing to all the plots.
⑤	40	0	0	
⑧	13	13	13	

- (5) Layout: Randomized with one replication. The size of plot was 260 m² (20 m × 13 m). L8 (2⁷) orthogonal table was applied excluding the plots, the treatment number of which was in a circle.
- (6) Spacing: 25 cm × 25 cm
- (7) Harvesting time: November 22, 1976

Result

The growth of rice plant in terms of plant height, number of tillers, leaf area index and dry weight of top part was shown in Table 3-1 and 2. The yield and its components were shown in Table 3-3 and Fig. 3-1. Rice grew well and yielded 4 ton/ha even in the check plot (No.1), probably because the test field was planted to mungbean in the preceding dry season. Accordingly, the difference of growth and yield among the plots was not so big but the following was found.

1. As for the basal dressing of nitrogen, there was seen the significant effect on the vegetative growth before the young panicle formation stage but the yield increase with the basal dressing was not significant.
2. Top dressing at the initial stage of young panicle formation significantly affected the growth in the reproductive growth period resulting in good yield with the

increase in number of panicles and number of spikelets per panicle which covered the decrease of ripening percentage.

3. Top dressing at the booting stage increased the ripening percentage significantly but its effect on yield increase was not significant.
4. The similar trend as mentioned above was observed in the plots of 40 kg of nitrogen application, accompanied with more increased yield.

Discussion

It was planned to top-dress at the IPF stage (30 to 35 days before flowering) and the booting stage (15 days before flowering) in the original design, applying the results obtained in another experiment by authors. However, it was eventually done at 25 days and 9 days before flowering in this experiment, since the growth period of rice was more shortened than that estimated from the previous experiments in different growing seasons.

As for the results of the experiment, only the top dressing at the initial stage of young panicle formation was found to be significantly effective in increasing the yield. The top dressing at the booting stage seemed too late to be significantly effective.

It is noticeable that the basal dressing did not induce significant increase of rice yield. Such a fact was probably related to the environmental conditions such as soil properties and climate as well as to the higher yield of the check plot than usual. Anyhow, the top dressing of nitrogen at the initial stage of young panicle formation had more pronounced effect than the basal dressing in increasing rice yield.

Table 3-1. Growth of rice plant as affected by timing of nitrogen application

No.	Treatment			Sept. 8		Sept. 27		Oct. 14		Nov. 9		
	A	B	C	H	T	H	T	H	T	C	P	F
				cm		cm		cm		cm	cm	cm
1	0	0	0	44.9	11.0	57.8	12.3	78.2	11.1	84.1	28.2	29.0
2	0	0	20	44.8	9.2	55.7	10.9	75.8	11.5	85.7	27.8	27.2
3	0	20	0	45.2	10.4	56.6	12.4	83.0	12.5	85.1	28.5	31.2
4	0	20	20	44.4	10.5	54.0	12.4	85.0	11.9	88.6	29.1	32.9
5	20	0	0	48.1	11.7	59.0	13.1	80.2	11.5	85.8	27.4	27.1
6	20	0	20	47.3	10.4	60.8	13.2	76.9	11.2	88.6	27.1	26.4
7	20	20	0	47.1	12.5	62.2	12.6	90.3	12.2	89.8	29.0	31.9
8	20	20	20	45.6	12.5	57.0	14.9	87.0	12.1	93.3	29.4	34.7
Effect												
		A		2.2*	1.5*	3.7*	1.5 ⁻	3.1 ⁻	0.0 ⁻	3.5**	-0.2 ⁻	0.1 ⁻
		B						6.1*	0.9*	3.2*	1.4*	5.1*
		C								2.9*	0.1 ⁻	0.4 ⁻
②	0	0	40	44.1	10.3	54.3	12.5	76.5	11.5	88.3	27.6	27.4
③	0	40	0	45.6	9.4	55.3	11.2	87.6	13.0	91.4	27.9	33.3
⑤	40	0	0	49.4	12.2	63.7	14.0	84.6	11.3	88.3	27.8	27.6
⑧	13	13	13	46.2	12.6	55.5	12.6	83.5	12.6	90.5	28.9	32.4

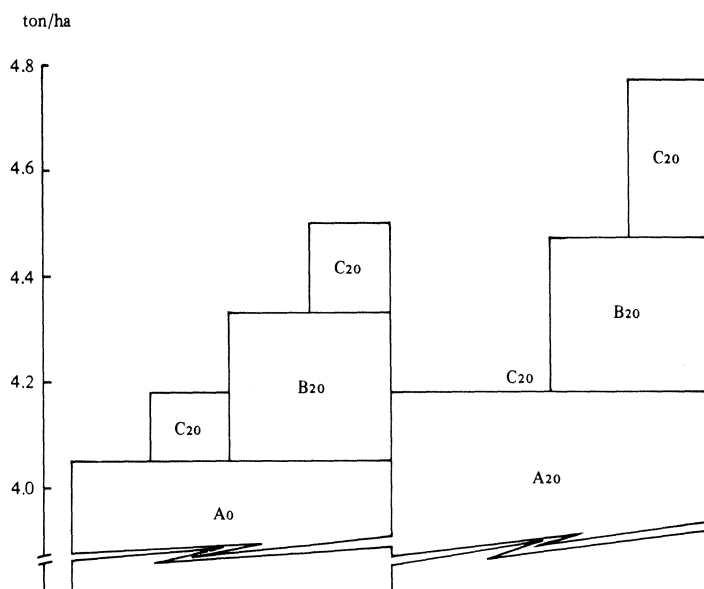
- Remarks 1) H, T, C, P and F respectively represent plant height, tiller number per hill, culm length, panicle length and flag leaf length.
 2) signs of **, * and - show the significance of the figure (effect of N application) with 1% and 5% level and non-significance, respectively.

Table 3-2. Leaf area index and dry weight of rice plant as affected by timing of nitrogen application

No.	Treatment			Sept. 27		Oct. 14		No. 9	
	A	B	C	LAI	Dry Wt.	LAI	Dry Wt.	LAI	Dry Wt.
					g/m ²		g/m ²		
1	0	0	0	1.55	213	2.63	440	1.29	725
2	0	0	20	1.56	219	2.32	400	1.27	699
3	0	20	0	1.46	216	3.53	535	1.51	771
4	0	20	20	1.46	217	2.87	462	1.74	781
5	20	0	0	1.76	274	2.76	464	1.23	744
6	20	0	20	1.79	250	2.45	446	1.08	727
7	20	20	0	1.80	255	3.50	564	1.51	842
8	20	20	20	1.80	255	3.13	513	2.16	919
Effect									
		A		0.28**	42**	0.12 ⁻	38*	0.04 ⁻	64 ⁻
		B				0.72**	81**	0.51*	105*
		C						0.18 ⁻	11 ⁻
②	0	0	40	1.73	234	2.55	460	1.44	734
③	0	40	0	1.38	193	3.33	486	2.50	824
⑤	40	0	0	2.49	323	2.69	512	1.15	775
⑧	13	13	13	1.49	221	2.03	419	1.63	845

Table 3-3. Yield and its components of rice as affected by timing of nitrogen application

No.	Treatment			Yield ton/ha	No. of panicles /m ²	No. of spikelets /panicle	Ripening percentage %	Weight of 1,000 grains g
	A	B	C					
1	0	0	0	4.05	163	118	74.6	28.4
2	0	0	20	4.18	165	109	83.2	27.8
3	0	20	0	4.33	173	129	72.6	26.7
4	0	20	20	4.50	172	124	77.5	27.1
5	20	0	0	4.19	168	108	80.3	28.8
6	20	0	20	4.17	167	107	82.3	28.3
7	20	20	0	4.47	176	124	74.3	27.6
8	20	20	20	4.77	171	122	80.1	28.6
Effect								
		A		0.14 ⁻	2 ⁻	-5*	2.3 ⁻	0.8 ⁻
		B		0.37**	7**	14**	-4.0*	-0.8 ⁻
		C		0.15 ⁻	-1 ⁻	-4 ⁻	5.3*	0.1 ⁻
②	0	0	40	4.12	156	110	85.5	27.3
③	0	40	0	4.65	187	120	74.6	27.7
⑤	40	0	0	4.18	167	105	81.6	29.1
⑧	13	13	13	4.12	162	115	80.0	27.7

**Fig.3-1 Yield of rice as affected by timing of nitrogen application**