P045

Effect of N rates applied at tillering and panicle initiation stage on crop growth, grain yield and protein content of rice

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Objectives

The study intends to determine the effect of N rates applied at tillering (13 days after transplanting, DAT) and panicle initiation stage (PIS, 64 DAT) on some selected indicators for crop growth, grain yield and protein content of rice.

Materials and Methods

A split-split-plot designed experiment was conducted in Experimental Farm, Seoul National University, Suwon City, Korea. N treatments at tillering (0, 36, 73 kg ha-1), N treatments at PIS (0, 36 kg ha-1) and two rice varieties (Hwasungbeyo and Daeanbyeo) were randomly assigned into main plots, sub plots and sub-sub plots, respectively. Rice was transplanted with distance of 30 x 15 cm and applied 80 kg P2O5 and 80 kg K2O ha-1, homogenously.

Maximum number of tillers was measured at 57 DAT while plant height, total biomass, yield and yield components and protein content was determined at harvest. The data was analyzed by ANOVA and contrast methods using SAS 8.1.

Results and Discussion

Effect of N rates on plant growth indicators

Table 1 indicates that increase of N rate to 72 kg ha-1 at tillering significantly increased plant height compared to 0 or 36 kg N ha-1. However, statistical difference ofnumber of tiller measured at 57 DAT or total biomass at harvest among different rate of N applied at tillering was not significantly detected. In contrast to N rate applied at tillering, N applied at PIS significantly increased total plant biomass but not plant height. Two varieties, Hwasungbyeo and Daeanbyeo used in the experiment were mot significantly differedin terms of plant height, tiller number and total biomass.

Effect of N rates on yield, yield components and protein content

No significant effect of 36 or 72 kg N ha-1applied at tillering on yield, yield components and protein content except reduction of 1000-grain weight (Table 2). The reduction of 1000-grain weight may result from the increase of number of spikelets due to high N rates at tillering. Increased N rate at PIS significantly increased yield and yield components (except number of panicles m-2) but at the same time it also increased milled rice protein content. The high protein content usually relates to low rice quality. However, milled rice protein content of about 6.7% at 36 kg N treatment is acceptable. Hwasungbyeo had higher number of filled spikelets and 1000-grain weight values, therefore, higher yield than those of Daeanbyeo.

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Table 1. Effect of N rates at tillering (Ntill) and at PIS (Npi) on some rice growth parameters.

Treatment	Plant height (cm)	Tiller (number m^{-2})	Total biomass (g m^{-2})
	Means		
Ntill : Npi = 0:0	95.7	464.4	1382.2
0:36	103.0	491.1	1448.4
36:0	95.8	473.3	1257.2
36:36	102.9	473.3	1498.3
72:0	101.8	470.3	1354.0
72:36	108.3	461.4	1590.7
Hwasungbyeo (V1)	101.7	469.1	1421.8
Daeanbyeo (V2)	100.8	475.5	1382.2
	Contrast analysis (P>F)		
Ntill: 0 vs. 36	0.980	0.838	0.559
0 vs. 72	0.008	0.586	0.377
36 vs. 72	0.008	0.733	0.148
Npi: 0 vs. 36	0.527	-	0.000
Variety: V1 vs. V2	0.614	0.718	0.138

Table 2. Effect of N rates applied at tillering (Ntill) and at PIS (Npi) on yield, yield components and milled-rice protein content.

Treatments	Panicle (No m-2)	Filled spikelet (no m-2)	1000-grain weight (g)	Grain yield (g m-2)	Milled rice protein (%)
			Means		
Ntill: Npi = 0:0	348.0	23424.5	27.5	644.4	6.3
0:36	334.7	26316.3	28.3	743.4	6.6
36:0	316.4	22536.8	27.5	618.8	6.3
36:36	359.5	26780.0	28.1	750.6	6.7
72:0	336.9	23569.2	27.0	635.8	6.3
72:36	348.4	29570.0	27.4	810.4	6.8
Hwasungbyeo (V1)	340.1	24157.8	27.3	658.3	6.4
Daeanbyeo (V2)	341.2	26574.5	27.9	742.8	6.6
Npi (kg ha-1):0	332.9	23117	27.3	631.3	6.3
36	346.2	27442	27.9	675.0	6.7
			Contrast analysis (P>F)		
Ntill: 0 vs. 36	0.816	0.873	0.727	0.806	0.829
0 vs. 72	0.927	0.208	0.026	0.439	0.749
36 vs. 72	0.746	0.158	0.055	0.311	0.914
Npi: 0 vs. 36	0.920	0.002	0.006	<.000	<.000
Variety: V1 vs. V2	0.924	0.033	0.008	0.010	0.178