

Growth analysis of drought tolerant potato lines (Konyu lines) in comparison to Konafubuki under different soil moisture conditions

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Introduction: Potato is the fourth most important field crop in terms of production. Due to its shallow root system, it is drought sensitive. With the frequency of drought increasing globally, potato faces a grave risk of yield reduction. Drought tolerance improvement of crops remains the most important alternative to mitigate yield loss especially in regions where water is already scarce, and irrigation is not an option. Konyu lines are drought tolerant lines bred at Hokkaido University. The current study was carried out to analyze its growth and yield in comparison to the commercial var. Konafubuki in water stress conditions.

Materials and methods: The study was carried out at the Experimental Farm of Hokkaido University under rain sheltered and irrigated plots. Konyu 1, 2 and 4 (K1, K2, K4) were grown with Konafubuki (KF). Sampling was done at three stages and dry weights of different plant parts, crop growth rate (CGR), tuber growth rate (TGR), net assimilation rate (NAR), leaf area index (LAI) were calculated. Yield was measured in terms of dry matter. Data analysis was done using SPSS 14.0.

Results and discussion: Total dry weights (TDW) in all the varieties reached same levels by 120 DAP in dry and wet plots whereas, tuber dry weight (TuDW) was varied. CGR, TGR and LAI were reduced by a lesser degree in K2 in the dry plots relative to the wet plots. K1 was found to be inefficient in partitioning assimilates to tubers. The ratio of dry plot to wet plot of yield was higher in Konyu lines than in KF. K2 recorded higher yields in both dry and wet plots. Konyu lines showed higher potential in maintaining yield under drought conditions than KF.

Table.1. TDW, TuDW (in $\text{gm}^{-2}\text{d}^{-1}$), LAI and tuber ratio at 120 DAP and yield (the values are means of two years)

Varieties	TDW	TuDW			LAI			Tuber ratio			Yield (tons/ha)			
	Mean ¹	Wet	Dry	Mean	Wet	Dry	Mean	Wet	Dry	Mean	Wet	Dry	Dry/Wet ³	Mean
K1	1446 a ²	807	610	708 b	5.89	4.64	5.27 a	0.48	0.53	0.51 d	12.5	12.0	96.0	12.3 b
K2	1503 a	1256	990	1123 a	3.95	3.74	3.85 b	0.73	0.75	0.74 b	17.0	15.0	88.2	16.0 a
K4	1581 a	1242	885	1064 a	4.59	4.05	4.32 ab	0.67	0.69	0.68 c	13.5	13.0	96.3	13.3 b
KF	1548 a	1361	1078	1220 a	2.79	2.85	2.82 c	0.79	0.82	0.80 a	16.0	12.0	75.0	14.0 b

¹Mean of wet and dry plots

² Within the same column, values followed by the same letters are not significantly different based on Tukey's HSD test at the 5% level of probability

³Percentage of dry plot yield, of that in wet plot

Table.2. CGR and TGR (the values are means of two years)

DAP	CGR ($\text{gm}^{-2}\text{d}^{-1}$)				TGR ($\text{gm}^{-2}\text{d}^{-1}$)			
	51-90 DAP		90-120 DAP		51-90 DAP		90-120 DAP	
	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry
K1	21.31	14.38	22.66	13.85	10.50	8.64	14.33	9.77
K2	25.33	17.99	16.04	12.20	20.18	15.21	15.04	12.10
K4	27.17	19.27	18.27	10.54	18.44	14.72	17.43	9.16
KF	28.42	17.55	13.18	10.06	21.82	15.35	15.03	13.00