

Effects of Salt Stress in Rice (*Oryza sativa* L.) Irradiated Low Dose Gamma Radiation

II. Effects on Photochemical Changes

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저선량 방사선 조사한 벼종자에서의 NaCl 처리 효과

II. 광화학적 변화에 미치는 영향

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Objectives

The various mechanisms of plants exposed to salt stress have been investigated in numerous plant species. The chlorophyll fluorescence has been used for detecting tolerance to chilling, freezing, drought and air pollution, and it may prove equally useful for detecting salt effects. Thus, we studied the responses of photosynthetic characteristics in Ilpum-byeo and Heukmi irradiated low dose gamma irradiation under salt stress.

Materials and Methods

- o Rice (*Oryza sativa* L., cv. Ilpum-byeo and Heukmi) seeds were irradiated at dose of 8 Gy by an irradiator (^{60}Co , ca.150 TBq of capacity, AECL). These seeds were harvested in 2001 and stored at room temperature until used.
- o After irradiation, sterilized seeds were sown on a styrofoam sheet with a nylon net bottom. The sheets were floated in plastic trays provided with distilled water (control), 50 and 100 mM NaCl solution. All samples were grown in glasshouse conditions and harvested 14-days old seedlings for determination of photosynthetic characteristics.
- o Seedling growth and photosynthetic characteristics were determined. The chlorophyll fluorescence was measured in leaf segments excised from three different leaves after 15 min dark adaptation with a chlorophyll fluorometer (IMAGING-PAM, WALZ, Effeltrich, Germany) at room temperature. The Chl contents of the leaves were determined after extraction in 80% acetone.

Results and Discussion

- o Ilpum-byeo showed a significant decrease in the maximal quantum yield of PSII or Fv/Fm at 100 mM NaCl, and the decrease was not affected by the low dose gamma radiation. But, the value of Fv/Fm in Heukmi was almost the same between control and NaCl-treated samples. Interestingly, non-photochemical quenching (NPQ) was inversely correlated with the increasing concentrations of NaCl. The irradiation group had lower NPQ values under the salt stress than unirradiation group.
- o The Chl contents of Heukmi were higher than those of Ilpum-byeo. The reduction of Chl contents in Ilpumbyeo and Heukmi was correlated with the increasing concentrations of NaCl. But, it was not affected by the low dose gamma radiation.

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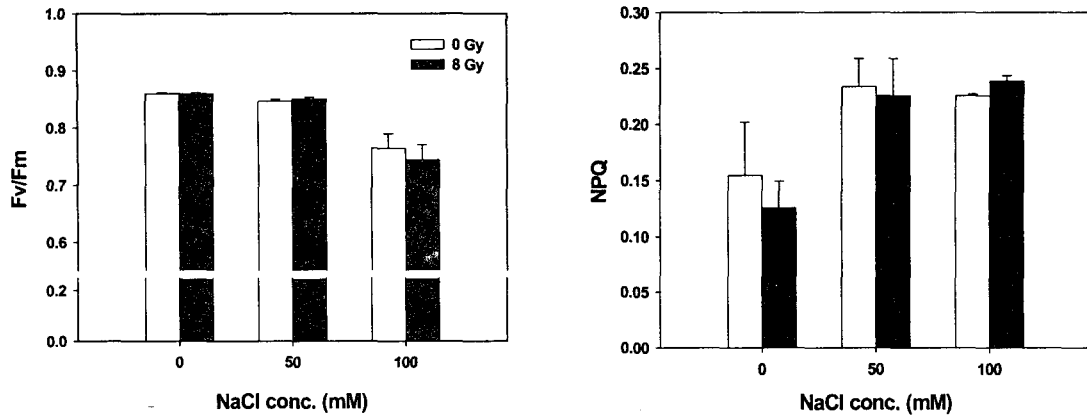


Fig 1. Photosynthesis characteristics in response to different concentrations of NaCl in Ilpum-byeo irradiated low dose gamma radiation. Vertical bars indicate \pm SE.

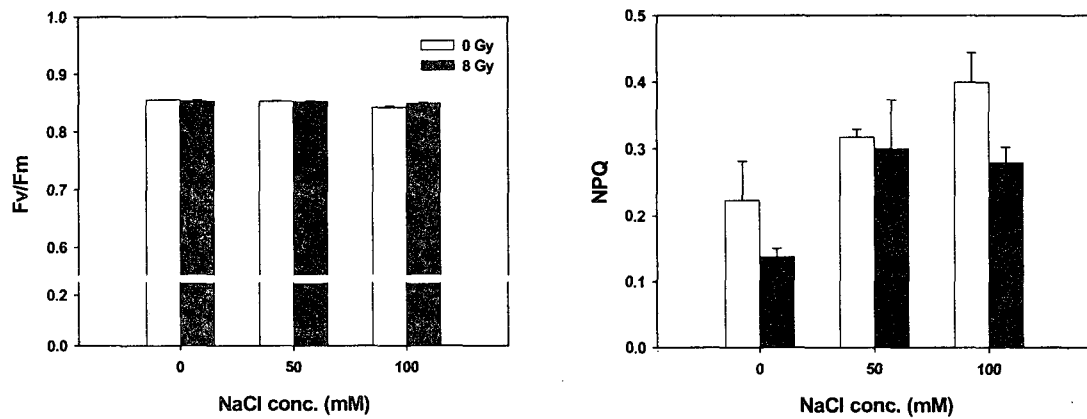


Fig 2. Photosynthesis characteristics in response to different concentrations of NaCl in Heukmi irradiated low dose gamma radiation. Vertical bars indicate \pm SE.

Table 1. Chlorophyll contents (mg/g f.w.) in response to different concentrations of NaCl in rice irradiated low dose gamma radiation.

NaCl (mM)	Dose (Gy)	Total Chl		Chl a		Chl b	
		Ilpum-byeo	Heukmi	Ilpum-byeo	Heukmi	Ilpum-byeo	Heukmi
cont.	0	1.80 \pm 0.03	2.25 \pm 0.03	1.40 \pm 0.01	1.71 \pm 0.02	0.38 \pm 0.03	0.52 \pm 0.01
	8	2.15 \pm 0.01	2.04 \pm 0.01	1.64 \pm 0.01	1.56 \pm 0.02	0.49 \pm 0.01	0.46 \pm 0.01
50	0	1.26 \pm 0.01	1.62 \pm 0.02	0.93 \pm 0.00	1.21 \pm 0.01	0.31 \pm 0.01	0.39 \pm 0.01
	8	1.56 \pm 0.01	1.44 \pm 0.02	1.07 \pm 0.00	1.08 \pm 0.02	0.37 \pm 0.00	0.34 \pm 0.01
100	0	0.38 \pm 0.00	0.76 \pm 0.00	0.29 \pm 0.00	0.56 \pm 0.00	0.09 \pm 0.00	0.19 \pm 0.00
	8	0.36 \pm 0.00	0.74 \pm 0.00	0.27 \pm 0.00	0.56 \pm 0.01	0.09 \pm 0.00	0.17 \pm 0.01

Values are mean \pm SE.