

**Synergistic Effects between Low Dose Gamma Radiation and Phytohormone  
in Rice (*Oryza sativa* L.)**

**II. Effects on Photochemical Changes**

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벼에서의 저선량 방사선과 식물호르몬간의 상승작용 효과

**II. 광화학적 변화에 미치는 영향**

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**Objectives**

Low dose gamma radiation frequently has a potential to promote growth of crops and vegetables. Also, auxin belongs to a class of phytohormones which are involved in growth and development of plants. In this study, synergistic effects between low dose gamma radiation and indole-3-butyric acid (IBA) at very low concentrations on seedling growth and photochemical changes were investigated.

**Materials and Methods**

- o Rice (*Oryza sativa* L., cv. Seorak-byeo) seeds were irradiated with the various doses from 0 to 8 Gy by an irradiator (<sup>60</sup>Co, ca.150 TBq of capacity, AECL). Seeds harvested in 1999 and stored at room temperature by July 24, 2003 were used.
- o After irradiation, seeds were sterilized with 3% sodium hypochlorite for 15 min and washed thoroughly with distilled water. Then, seeds were sown on a styrofoam sheet with a nylon net bottom. The sheets were floated in plastic trays provided with distilled water (control), 0.0001 ppm and 0.001 ppm IBA solutions. Plants were grown in glasshouse conditions. Photosynthetic characteristics were measured with 20-days old seedlings.
- 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.

**Results and Discussion**

- o Seedling growth was significantly increased in response to low dose gamma radiation and IBA. A synergistic effect was found in low dose gamma radiation and IBA. Increase in shoot growth was more pronounced than that of root.
- o Effective quantum yield of PSII ( $\Phi_{PSII}$ ) and photochemical quenching (qP) were increased, while non-photochemical quenching coefficient (qN) was decreased by IBA.
- o The synergistic effect between low dose gamma radiation and IBA in the growth of shoot was also partly contributed by photosynthetic activities.

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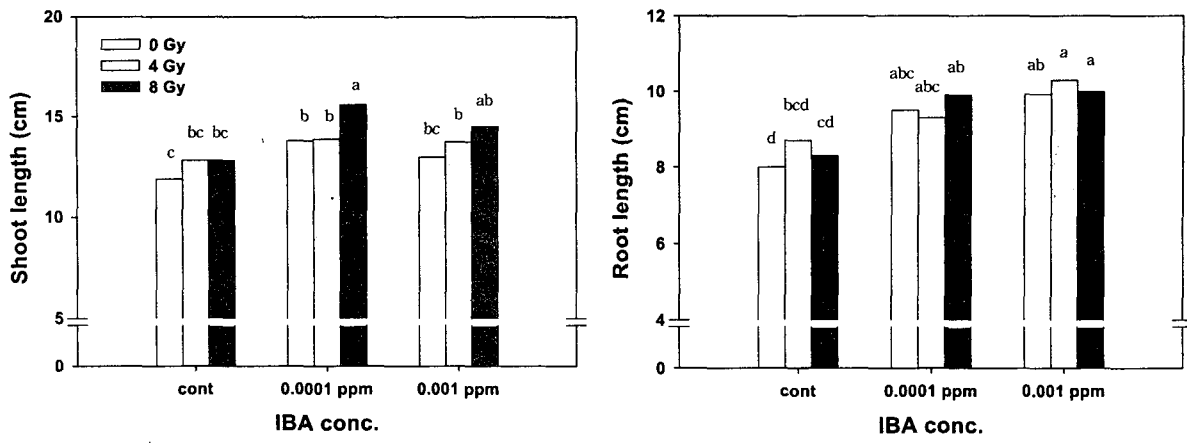


Fig 1. Synergistic effects of low dose gamma radiation and IBA on seedling growth in rice. Data with same letters are not significantly different within each column at 5% level by DMRT.

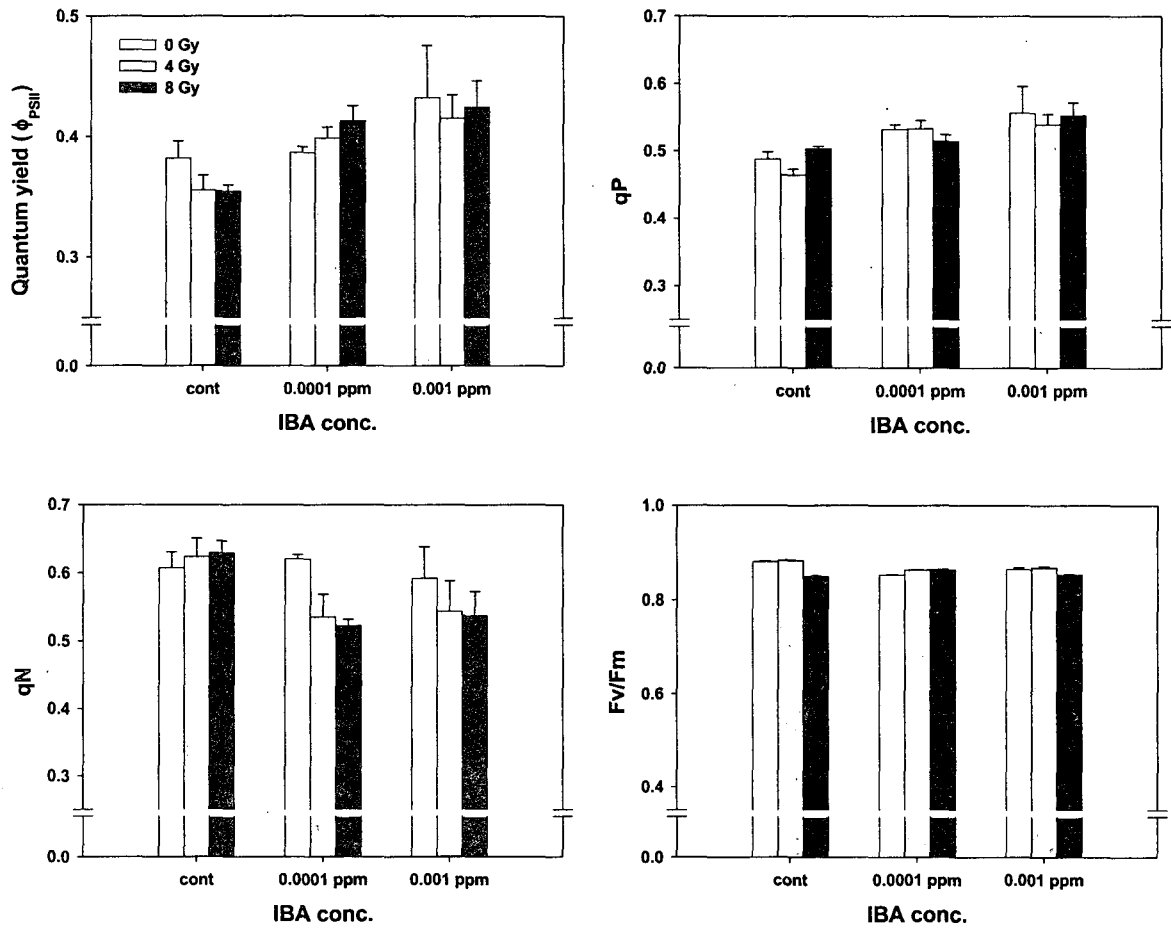


Fig 2. Synergistic effects of low dose gamma radiation and IBA on photosynthetic characteristics of 20-days old rice leaves. Vertical bars indicate  $\pm$  SE.