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Effects of Gamma Irradiation on Cell Wall Formation of *Arabidopsis thaliana* L.

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Objectives

Low doses of gamma irradiationcan induce physiological and biochemical changes, resulting in faster vegetative growth and early flowering. However, there is no report on the relationship between low dose gamma irradiation and cell wall formation. Therefore, it is necessary for investigating the effect of gamma irradiation on cell wall formation.

Materials and Methods

o Dry seeds (*Arabidopsis thaliana*L.) were irradiated at 0-200 Gy by gamma-ray irradiator (^{60}Co, ca.150 TBq of capacity, AECL). The plants were grown in the Chungbuk National University green house facilities. The extract free residues were performed various experiments such as germination and growth rates, lignin content, alkaline nitrobenzene oxidation (NBO), neutral sugar composition, and histochemical analyses.

Results and Discussion

o The first experiment on seeds exposed to relatively low and high doses of ionizing radiation (0-200 Gy) was performed to select optimum dose of stimulating effect. The optimum dose based on the results of germination and growth rates is 40 Gy. Nineteen days after sowing (DAS), seeds exposed to 40 and 200 Gy showed a departure from the stem height and lignin content of the control. Seeds exposed to 40 Gy were significantly higher stem height and lignin content than control. In contrast, significant decreases occurred in both stem height and lignin content at 200 Gy. These differences continued for up to 31 DAS. Interestingly, all plants return to normal in terms of stem height and lignin content from 34 DAS. These results were confirmed by analyses of lignin units. The predominant lignin units such as guaiacyl and syringyl units were very similar to the trend of stem height and lignin content. In addition, morphological changes at 40 and 200 Gy were performed by histochemical analysis. Seeds exposed to 40 Gy were well developed xylem region, while 200 Gy irradiated samples were relatively inhibited xylem from development.

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Fig. 1. Phenotypes of 19 day-old-arabidopsis plants irradiated with 0-200 Gy.

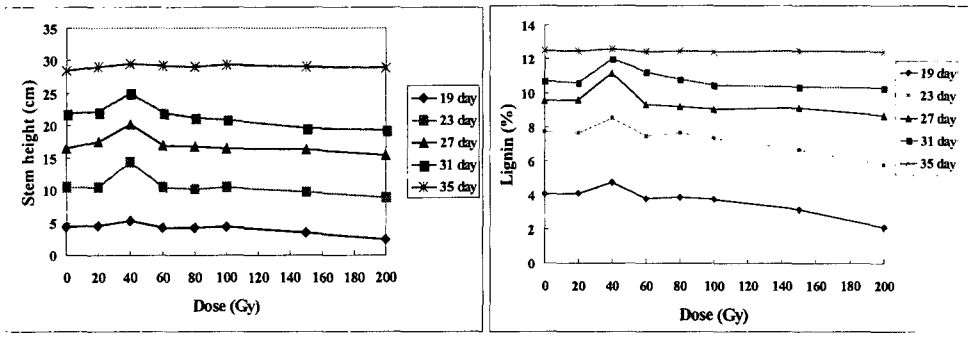

Fig. 2. Effect of gamma radiation on the stem height (left) and lignin content (right) of arabidopsis stem.

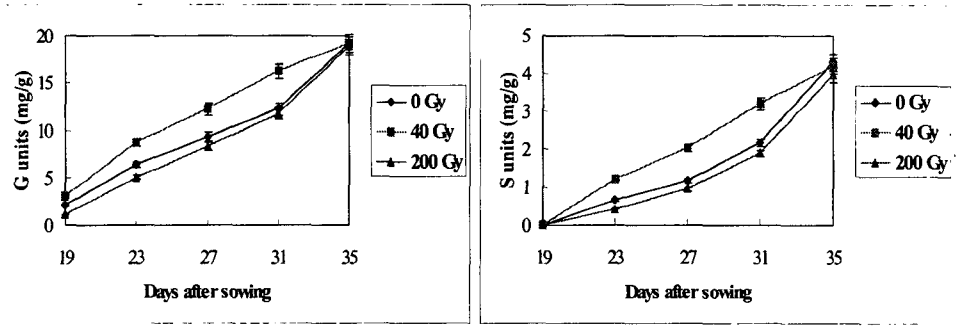

Fig. 3. G unit (left) and S unit (right) contents of lignins of developing arabidopsis irradiated with 0-200 Gy.

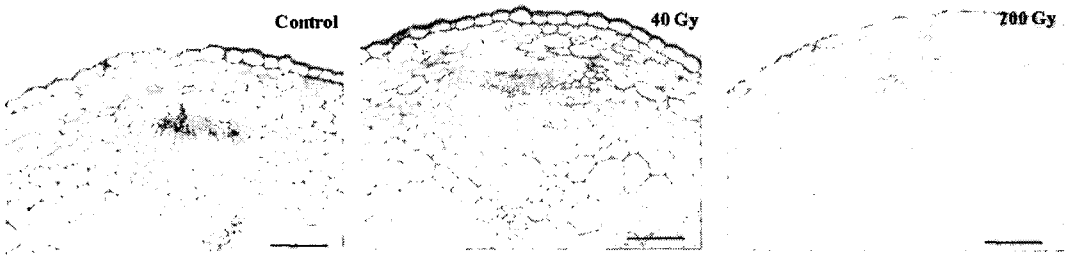

Fig. 4. Morphological changes of arabidopsis at 19 DAS.