



Title	Effect of Circularly Polarized Light on Germination, Hypocotyl Elongation and Biomass Production of Arabidopsis and Lettuce; Involvement of Phytochrome B [an abstract of dissertation and a summary of dissertation review]
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Abstract of Doctoral Dissertation

Degree requested: Doctor of Life Science

Applicant's name: Lkhamkhuu Enkhsukh

Title of Doctoral Dissertation

Effect of Circularly Polarized Light on Germination, Hypocotyl Elongation and Biomass Production of Arabidopsis and Lettuce; Involvement of Phytochrome B

(植物における左右円偏光の発芽・胚軸伸長・成長に与える影響に関する研究)

Circular dichroism (CD), defined as the differential absorption of left- and right-handed circularly polarized light (CPL), is a useful spectroscopic technique for structural studies of biological systems composed of chiral molecules. The present study evaluated the effects of CPL on germination, hypocotyl elongation and biomass production of Arabidopsis and lettuce. Higher germination rates were observed when Arabidopsis and lettuce seedlings were irradiated with red right-handed CPL (R-CPL) than with red left-handed CPL (L-CPL). In contrast, hypocotyl elongation was greater when Arabidopsis and lettuce seedlings were irradiated with red L-CPL than with red R-CPL. This difference was not observed when a phytochrome B (phyB) deficient mutant of Arabidopsis was irradiated, suggesting that inhibition of elongation by red R-CPL was mediated by phyB. White R-CPL induced greater biomass production by adult Arabidopsis plants, as determined by their fresh shoot weight, than white L-CPL. These differential effects on biomass production were observed following irradiation with red and blue, but not green, CPL. To determine the molecular basis of these CPL effects, CD spectra and the effect of CPL on the photoreaction of a sensory module of Arabidopsis phyB were measured. The red light-absorbing form of phyB showed a negative CD in the red light-absorbing region, consistent with the results of germination, inhibition of hypocotyl elongation and biomass production. L-CPL and R-CPL, however, did not differ in their ability to induce the interconversion of the red light-absorbing and far-red light-absorbing forms of phyB. These findings suggest that these CPL effects involve phyB, along with other photoreceptors and the photosynthetic process.