

PB8) Diurnal Changes of Chlorophyll Fluorescence
and Antioxidative Enzymes of the Leaves of
Four Subtropical Plants under Natural
Condition

Soonja Oh*, Kook Lhim Chin and Seok Chan Koh
Department of Life Science & Research Institute for Basic
Sciences, Cheju National University

1. Introduction

Low temperature is the major factor limiting the productivity and geographical distribution of plant species, and it can inhibit several metabolic processes seriously and thus can be stressful to plants. This stress is particularly severe in plants with a tropical or subtropical evolutionary background. In the present study we investigated chlorophyll fluorescence and antioxidative enzyme activity in leaves of four subtropical plants, *Crinum asiaticum* var. *japonicum*, *Osmanthus insularis*, *Chloranthus glaber* and *Asplenium antiquum*, growing under the natural habitat.

2. Material and Methods

Chl a fluorescence transient was measured by the Plant Efficiency Analyzer (PEA, Hansatech Ltd., UK) with an actinic light of 1,500mole/m²/s and analysed according to the JIP-test (Strasser and Strasser, 1995). Chl a fluorescence imaging was performed using a commercial imaging fluorometer (Fluorcam 700MF, P.S. Instrument, Czech Republic) described in Nedbal *et al.*(2000). The isoenzyme patterns and activities of catalase, superoxide dismutase, ascorbate peroxidase and peroxidase were determined as described by Oh and Koh (2004).

3. Results and Conclusions

The diurnal change of chlorophyll fluorescence and antioxidative enzyme activity were investigated from leaves of four subtropical plant species (*Crinum asiaticum* var. *japonicum*, *Osmanthus insularis*, *Chloranthus glaber* and *Asplenium antiquum*) under the natural conditions in summer and winter. In the O-J-I-P transients of these species, the fluorescence intensity of *Crinum asiaticum* var. *japonicum* and *Osmanthus insularis* were found to be higher in O-step and lower P-step at midday in summer. However, those of

four subtropical plant species in winter were not showed diurnal character. The peroxidase activity and isoenzymes pattern showed difference according to plant species and environmental conditions. Briefly, peroxidase activity in four subtropical plant species slightly increased in winter than in summer, and some isoenzymes appeared from three plant speceis (*C. asiaticum* var. *japonicum*, *O. insularis* and *A. antiquum*) in winter. Therefore, the activity of catalase in *Crinum* plants was decreased in contrast to increase of those in other plant species. (*O. insularis* and *A. antiquum*)

Reference

- Strasser, B. J. and Strasser, R. J., 1995, Measuring fast fluorescence transients to address environmental questions: the JIP test. In: Mathis P, Ed. Photosynthesis: from Light to Biosphere. V. Dordrecht : Kluwer Academic Publishers, 977-980.
- Nedbal, L., Soukupova, J., Kaftan, D., Whitmarsh, J. and Trtílek M., 2000, Kinetic imaging of chlorophyll fluorescence using modulated light. Photosynth. Res., 66, 3-12.
- Oh, S. J., Koh, S. C., 2004, Chlorophyll fluorescence and antioxidative enzyme activity of *Crinum* leaves exposed to natural environmental stress in winter, Korean J. Environ. Biol., 22(1), 233-241.