

Assessment of Drought Tolerance using Chlorophyll Fluorescence Analysis in Garden Plants

Tae-seon Eom¹, Seong-ju Lee², Taek-jin Yoon², Seung-Won Han³, Sung-Yung Yoo¹

¹ Institute of Ecological Phytochemistry, Hankyong National University,
Anseong 17579 Gyeonggi-do, Republic of Korea
First.ymh5240@naver.com; Corresponding author: lsn136@hknu.ac.kr

² Department of Natural Resources and Environment, Hankyong National University,
Anseong 17579 Gyeonggi-do, Republic of Korea

³ Urban Agriculture Research Division, National Institute of Horticultural and Herbal Science, RDA,
Wanju 55365, Republic of Korea

Extended Abstract

As the social demand for a beautiful urban landscape increases, urban horticulture and urban gardening are becoming more active. [1] However, due to the nature of the urban environment with many artificial structures, it is vulnerable to climate change, so wet and drought are occurring irregularly and repeatedly in urban gardens. [2] In this study, drought tolerance was assessed using chlorophyll fluorescence analysis on major garden plants used in urban gardening.

Drought stress treatment was carried out under conditions of irrigation (control group) and non-irrigation (treatment group) for 14 species in the greenhouse of Hankyong National University in September 2021. Chlorophyll fluorescence (OJIP) was measured 5 times at 0 hr, 24 hr, and 48 hr after dark treatment for leaf 30 minutes using a chlorophyll fluorescence analyzer (FP-100, PSI). [3]

It was confirmed that the photochemical performance index (PI ABS) decreased after drought treatment in most garden plants. So, the drought stress index (DFI) was calculated using PI ABS as follows ($DFI = \log(A) + 2\log(B)$; $A=24\text{hr PI ABS treatment/PI ABS control}$, $B=48\text{hr PI ABS treatment/PI ABS control}$). In this study, DFI was classified into 4 groups, and the criteria were $I \geq 0.5$, $II \geq 0$, $III \geq -0.5$, and $IV < -0.5$. As a result of the grading assessment of drought stress of garden plants, the I Group of *Carex maculata* Boott, *Aster sphathulifolius* Maxim and the II Group of *Gaura Lindheimeri* Engelm, et A.Gray, *Sedum kamtschaticum* FISCH, *Veronica linariaefolia* Pall, *Aquilegia oxysepala* Trautv. & C. A. Mey, *Pachysandra terminalis* Siebold & Zucc, *Potentilla fragarioides* var. Major, *Lilium lancifolium* Thunb, *Phlox paniculata* L, *Heuchera sanguinea* are confirmed to have strong tolerance for drought stress. On the other hand, *Cynara cardunculus* var. *Scolymus* and *Chrysanthemum indicum* L. belongs to III Group and have relatively weak drought tolerance. *Nandina domestica* Thunb, a shrub of which is classified as Group IV, has the weakest drought tolerance among the selected garden plants.

Therefore, it was clearly concluded that effective water management of garden plants using the drought stress index was possible for an urban garden management.

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References

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