The comparison of photosynthetic function and water status between roadside shrub trees under drought stress

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Roadside trees are expected to play roles for CO_2 absorption and cooling by transpiration. However, plants in urban area are exposed to high temperature and drought stress condition during summer. Drought stress decreases photosynthetic rate of roadside trees because of the stomatal closure. Therefore, summer drought will affect CO_2 absorption and cooling by transpiration of roadside trees, and thus, will reduce mitigation effect on urban warming. Many previous studies have shown that different plant species show different response to drought stress. In this study, photosynthetic function, water status and carbon stable isotopic ratio in five representative roadside shrub trees under drought stress were measured to compare their drought tolerance and recovery from drought stress.
Rhododendron pulchrum, Rhododendron obtusum, Rhaphiolepis umbellate var. integerrima, Forsythia suspense and *Camellia hiemalis* were used for the experiment. Seedlings of trees were pot-grown in a greenhouse in Kyoto Institute of Technology. Drought and recovery experiments were performed sequentially. First, watering was stopped during the drought experiment. Stomatal conductance was measured several times using Li-6400 for a fully matured leaf. When soil fully dried, plants were re-watered to perform recovery experiment. A-C_i curve was obtained using Li-6400. Water potential was measured using pressure chamber in three stages: pre-drought (control), post-drought (when stomatal conductance value becomes 20%~30% compared with pre-drought value), recovery (when increases in pot weights were mostly stopped for three days). Leaves for carbon stable isotope ratio measurement were collected at each stages.
Photosynthetic rate and water potential significantly decreased in all tree species at the post-drought stage, with these values were recovered to those at the pre-drought stage. Maximum decreasing rate of photosynthesis from pre-drought to post-drought was 84% observed for *R. obtusum*, while minimum value was 55% observed in *F. suspense*. Maximum recovery rate of photosynthesis at the recovery stage was 99% observed for *C. hiemalis*, while minimum recovery rate was 67% observed for *R. obtusum.* Minimum decreasing rate of water potential at the post-drought stage was 470% observed in *R. pulchrum*. These results suggest that *F. suspense* can maintain high photosynthetic rate during drought stress, while *C. hiemalis* has high recovery rate from drought stress. R. ×pulchrum has the highest ability to maintain plant water status in post-drought and recovery stages. These results will help for the effective selection of roadside trees.

