

## Influence of atmospheric pollutants on roadside trees in Kyoto city

\*Saya Yamagishi<sup>1</sup>, Etsu Yamada<sup>1</sup>, Yuko T. Hanba<sup>1</sup>

1. Kyoto Institute of Technology University

Atmospheric pollutants impair physiological activities of plants. The concentration of photochemical oxidant ( $O_x$ ), which is one of the atmospheric pollutants, has been increased year by year in Kyoto city from 1981 to 2015. Thus, trees growing in Kyoto city are possibly influenced by  $O_x$ . In this study, we investigated the effect of  $O_3$  on the roadside trees. We measured  $O_3$  concentration at three study sites in Kyoto city where  $O_3$  concentration is expected to be different, to evaluate the physiological activities of the roadside trees in these sites.

We selected three study sites in Kyoto city, such as Omiya (35°01'08.N 135°75'20.E), Yamashina (34° 97'18.N 135°81'45.E), and Nishinokyo (35°01'83.N 135°73'08.E). These sites were selected according to the  $NO_x$  concentration in order to compare effects of different levels of  $O_3$  on roadside trees. The species investigated were *Rhododendron pulchrum* and *Prunus yedoensis*, which are major roadside trees in Kyoto city. Average concentration of  $O_3$  were measured twice at study sites, using passive samplers for 7 days in early June and late November in 2016. It is expected that the trees growing in a study area with a high concentration of  $O_3$  have more decreased physiological activity. Photosynthetic activity was evaluated by gas exchange parameters using a portable photosynthesis system, Li-6400 (LI-COR). In addition, stable carbon isotope ratios, which are indicators for long-term water use efficiency, were measured using CN-IRMS. In order to identify factors affecting photosynthetic activity, the relationship between environmental and photosynthetic variables were analyzed by Pearson's moment correlation analysis.

$O_3$  concentration in early July was 75.8 ppb at Omiya, 80.8 ppb at Yamashina, and 55.6 ppb at Nishinokyo. The photosynthetic rate of *P. yedoensis* measured at PPFD of  $1500 \mu\text{mol m}^{-2} \text{s}^{-1}$  was significantly higher in Yamashina than those in the other study sites. The same trends were obtained for stomatal conductance ( $g_s$ ). Maximum carboxylation rate of Rubisco ( $V_{\text{cmax}}$ ) and electron transport rate in thylakoid membrane ( $J$ ) were high in Nishinokyo for *R. pulchrum*, which suggests that biochemical activity in photosynthesis was high in Nishinokyo in *R. pulchrum*. Although there was a difference in the photosynthetic activity of these roadside trees between the study sites, correlation analysis showed that there was no correlation between  $O_3$  concentration and photosynthetic activity. The carbon isotope discrimination in leaves of *R. pulchrum* showed high values in Omiya and Yamashina, which suggested that water use efficiency was high at these two sites.

We conclude that  $O_3$  concentration was not related to the photosynthetic rate of the roadside trees in Kyoto city. Possibility the concentration of  $O_3$  in the all three study sites was not so high as to affect the roadside trees.