Application of foliar hydrogen peroxide concentration as an environmental stress indicator to evaluate the plant species distribution in the riparian zone

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Riparian vegetation is constantly exposed to variable intensities of hydrological stress and edaphic species (ROS) are consequently generated in the organelles of plant cells based on the intensity of the stress. The current study is aimed to examine whether quantification of environmental stress using foliar hydrogen peroxide concentration can be used to explain riparian vegetation distribution, instead of using classic abiotic parameter measurements.

Observation was conducted in the riparian zones of Japanese rivers, for common woody and herbaceous species: different *Salix* species, *Robinia pseudoacacia*, *Ailanthus altissima*, and *Juglans mandshurica* as representative tree species, and *Phragmites australis*, *Phragmites japonica*, and *Miscanthus sacchariflorus* as representative herb species. The locations of colonies were taken with respect to the elevation from the ordinary water level. Leaf tissue of each species was sampled, both in light exposed and shaded conditions, at different elevations along transects perpendicular to the river and H2O2 concentration in the leaf tissue was analysed. At the same time, soil was sampled and analysed for nitrogen, phosphorus and moisture content. The comparison between light exposed and dark-adapted samples indicated that solar radiation could not be identified as a stressor for the plants, and nor did H2O2concentration change systematically with prevailing nutrient conditions. Thus, soil moisture was the most important significant stress factor for plants in the riparian zone. Soil moisture content decreased with elevation. Unique relationships were observed between plant leaf H2O2 concentration and soil moisture content for different vegetation types (trees vs. herbs). The H2O2 concentration of tree species, except for Salix spp., decreased with decreasing moisture content regardless of species, while that of *Salix spp*. increased with increasing soil moisture. H2O2 concentration of all herb species increased with soil moisture. The study thus suggests that foliar H2O2 concentration can be used as an indicator of distribution of riparian vegetation.