Responses of photosynthesis to high temperatures in trees: acclimation of the thermal break point of photochemistry to heat and drought

Daniel D. Epron, Hana Ghouil, Chiraz Daas, Fabienne Froux, Charlie Warren, Erwin Dreyer

2.4.4 Responses of photosynthesis to high temperatures in trees: acclimation of the thermal break point of photochemistry to heat and drought

Daniel Epron[1], Hana Ghouil[2], Chiraz Daas[2], Fabienne Froux[1], Charlie Warren[3], Erwin Dreyer[1]

[1] UMR INRA-UHP « Ecologie et Ecophysiologie Forestières », F 54280 CHAMPENOUX, France; dreyer@nancy.inra.fr
[2] Laboratoire d'Ecophysiologie et de Reboisement, Institut National de Recherches Forestières, Tunis, Tunisie
[3] Forest Science Center, University of Melbourne and Department of Environment of Victoria, Creswick, Vic. 3363, Australia

The physiological processes contributing to photosynthesis (i.e., photochemistry, carbon reduction cycle, CO_2 diffusion through stomata and to the chloroplasts) display different responses to high temperatures that still need to be better documented, despite the knowledge acquired during the past decades. The thermal optima of photochemistry and rubisco activity have been found to be around 35 and 38 C; but neither the inter and intra-specific diversity of this parameter, nor the ability of these optima to acclimate to rapidly changing environmental conditions have yet been clearly established. The thermal breakpoint of chlorophyll fluorescence is frequently used as one of the indexes for the thermostability of PSII and thylakoid membranes. This breakpoint is usually close to 45 C in many species. Recent experiments have shown that it is highly plastic, increases by up to 10 C being induced either by drought or by gradually increasing temperatures. In this presentation, we will summarise the information available in this field, as well as show the latest evidence documenting the plasticity of this parameter and the consequences it might have for the photosynthetic functions as a whole, basing on experiments with oak trees.