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Interactive effects of air temperature, vapor pressure deficit, soil water availability and ambient CO_2 concentration on growth of hybrid poplar J-105

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The ongoing global climate change is altering the environmental conditions for wide range of terrestrial ecosystems. In Central Europe, an increasing air temperature trends, more frequent summer heat waves and uneven temporal distribution of precipitation resulting in increased drought events frequency has been extensively reported. The climate change affects the entire region in different ways, with no exception for man-managed agroecosystems. One of rather complementary agroecosystems is represented by short-rotation woody coppice (SRWC) cultivated for the biomass/bioenergy production. Considering that the life span of SRWC is 20-30 years, careful identification of the optimal and limiting environmental conditions is necessary prior the establishment.

Although many studies investigated the sensitivity of biomass productivity to a single environmental factor (drought, air temperature, CO_2 concentration), we attempted to address growth responses of hybrid poplar to multiple co-occurring environmental forcings – a situation that represents more realistically the natural environment. Therefore, we established an experiment using five indoor step-in growth chambers with fully adjustable internal weather conditions. Each chamber accommodated 12 pots with hybrid poplar shoots (*Populus nigra* × *P. maximowiczii*). First chamber was considered as a control, with typical Central European summer day weather - maximum air temperature (T_{max}) of 25 ˚C and maximum vapor pressure deficit (VPD_{max}) of 1.6 kPa. Poplars in four remaining chambers were exposed to interactive effects of hot day weather with high air temperature (T_{max} = 32 ˚C), two levels of VPD (low $VPD_{max} \leq 1$ kPa or high $VPD_{max} \sim 3.1$ kPa), ambient CO_2 concentrations (400 or 700 ppm) and soil water availability (watered and drought-stressed). These default diurnal courses were further interrupted by two 7-days long periods of heat waves (T_{max} = 37 ˚C, VPD_{max} = 4.1 kPa), which were separated in time by two weeks long period of acclimation. Each week we measured stem increments. After 46 days, the experiment was terminated and the above/below-ground biomass was harvested and analyzed. Preliminary results will be presented on EGU 2018 meeting at poster presentation.

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